Strata® CTX

Digital Business Telephone Systems

CTX28, CTX100-S, CTX100 and CTX670 Installation and Maintenance Manual

June 2004

Strata CTX28, CTX100 and CTX670 General End User Information

The Strata CTX28, CTX100 or CTX670 Digital Business Telephone System is registered in accordance with the provisions of Part 68 of the Federal Communications Commission's Rules and Regulations.

FCC Requirements

Means of Connection: The Federal Communications Commission (FCC) has established rules which permit the Strata CTX28, CTX100 or CTX670 system to be connected directly to the telephone network. Connection points are provided by the telephone company—connections for this type of customer-provided equipment will not be provided on coin lines. Connections to party lines are subject to state tariffs.

Incidence of Harm: If the system is malfunctioning, it may also be disrupting the telephone network. The system should be disconnected until the problem can be determined and repaired. If this is not done, the telephone company may temporarily disconnect service. If possible, they will notify you in advance, but, if advance notice is not practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Service or Repair: For service or repair, contact your local Toshiba telecommunications distributor. To obtain the nearest Toshiba telecommunications distributor in your area, log onto www.toshiba.com/taistsd/locator.htm or call (800) 222-5805 and ask for a Toshiba Telecom Dealer.

Telephone Network Compatibility: The telephone company may make changes in its facilities, equipment, operations, and procedures. If such changes affect the compatibility or use of the Strata CTX28, CTX100 or CTX670 system, the telephone company will notify you in advance to give you an opportunity to maintain uninterrupted service.

Notification of Telephone Company: Before connecting a Strata CTX28, CTX100 or CTX670 system to the telephone network, the telephone company may request the following:

1. Your telephone number.
2. FCC registration number:
   - Strata CTX28, CTX100 or CTX670 may be configured as a Key, Hybrid or PBX telephone system. The appropriate configuration for your system is dependent upon your operation of the system.
   - If the operation of your system is only manual selection of outgoing lines, it may be registered as a Key telephone system.
   - If your operation requires automatic selection of outgoing lines, such as dial access, Least Cost Routing, Pooled Line Buttons, etc., the system must be registered as a Hybrid telephone system. In addition to the above, certain features (tie Lines, Off-premises Stations, etc.) may also require Hybrid telephone system registration in some areas.
   - If you are unsure of your type of operation and/or the appropriate FCC registration number, contact your local Toshiba telecommunications distributor for assistance.
   - **CTX28 FCC/ACTA Registration Numbers**
Hybrid: CJ6MF03BDTCHS28, fully-protected multifunction systems
Key: CJ6KD03BDTCHS28, key systems for analog applications
   - **CTX100 Registration Numbers**
PBX: CJ6MUL-35931-PF-E, fully-protected PBXs
Hybrid: CJ6MUL-35930-MF-E, fully-protected multifunction systems
Key: CJ6MUL-35929-KF-E, fully-protected telephone key systems
   - **CTX670 Registration Numbers**
PBX: CJ6MUL-35934-PF-E, fully-protected PBXs
Hybrid: CJ6MUL-35933-MF-E, fully-protected multifunction systems
Key: CJ6MUL-35932-KF-E, fully-protected telephone key systems
   - Ringer equivalence number: 0.3B. The ringer equivalence number (REN) is useful to determine the quantity of devices which you may connect to your telephone line and still have all of those devices ring when your number is called. In most areas, but not all, the sum of the RENs of all devices connected to one line should not exceed five (5.0B). To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your local telephone company to ascertain the maximum REN for your calling area.
3. Network connection information USOC jack required: RJ11/14C, RJ21/2E/2F/2G/2HX/RJ49C (see Network Requirements in this document). Items 2, 3 and 4 are also indicated on the equipment label.
4. Authorized Network Parts: 02LS2/GS2, 02RV2-T/O, OL13C/B, T11/12/31/32M, 04DU9-BN/DN/1SN, 02IS5, 04DU9-BN/DN/1SN1ZN

Radio Frequency Interference

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the manufacturer's instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case, the user, at his/her own expense, will be required to take whatever measures may be required to correct the interference.

This system is listed with Underwriters Laboratory.

UL Requirement: If wiring from any telephone exits the building or is subject to lightning or other electrical surges, then secondary protection is required. Secondary protection is also required on DID, OPS, and Tie lines. (Additional information is provided in this manual.)

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CP01, Issue 8, Part I Section 14.1
Notice: The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the Equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION! **Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.**

CP01, Issue 8, Part I Section 14.2
Notice: The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The terminal on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the Devices does not exceed 5.

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CTX-MA-IM/MT-VE

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Toshiba America Information Systems, Inc.
Digital Solutions Division
9740 Irvine Boulevard
Irvine, California 92618-1697
United States of America

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Digital Solutions Division

Limited Warranty

Toshiba America Information Systems, Inc., ("TAIS") warrants that this telephone equipment (except for fuses, lamps, and other consumables) will, upon delivery by TAIS or an authorized TAIS dealer to a retail customer in new condition, be free from defects in material and workmanship for twenty-four (24) months after delivery. This warranty is void (a) if the equipment is used under other than normal use and maintenance conditions, (b) if the equipment is modified or altered, unless the modification or alteration is expressly authorized by TAIS, (c) if the equipment is subject to abuse, neglect, lightning, electrical fault, or accident, (d) if the equipment is repaired by someone other than TAIS or an authorized TAIS dealer, (e) if the equipment's serial number is defaced or missing, or (f) if the equipment is installed or used in combination or in assembly with products not supplied by TAIS and which are not compatible or are of inferior quality, design, or performance.

The sole obligation of TAIS or Toshiba Corporation under this warranty, or under any other legal obligation with respect to the equipment, is the repair or replacement by TAIS or its authorized dealer of such defective or missing parts as are causing the malfunction with new or refurbished parts (at their option). If TAIS or one of its authorized dealers does not replace or repair such parts, the retail customer's sole remedy will be a refund of the price charged by TAIS to its dealers for such parts as are proven to be defective, and which are returned to TAIS through one of its authorized dealers within the warranty period and no later than thirty (30) days after such malfunction, whichever first occurs.

Under no circumstances will the retail customer or any user or dealer or other person be entitled to any direct, special, indirect, consequential, or exemplary damages, for breach of contract, tort, or otherwise. Under no circumstances will any such person be entitled to any sum greater than the purchase price paid for the item of equipment that is malfunctioning.

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Introduction

This manual provides detailed step-by-step instructions for installing and maintaining the Strata CTX100-S, CTX100 and CTX670 digital business telephone systems. It is intended for qualified service technicians and system programmers.

Use this manual in conjunction with the *Strata CTX Programming Manual* which covers the programs related to the Strata CTX28, CTX100-S, CTX100 and CTX670 systems discussed in this book.

Organization

This manual is organized into these sections/chapters for your convenience:

- **Chapter 1 – Strata CTX Configuration** explains how to configure a Strata CTX28, CTX100-S, CTX100 or CTX670 system. It also provides worksheets for determining hardware and station equipment placement and requirements.
- **Chapter 2 – CTX28 Installation** covers site requirements, input power requirements, cable lengths/network requirements, and grounding requirements for the CTX28.
- **Chapter 3 – CTX100-S/CTX100 Installation** covers site requirements and Base and Expansion cabinet installation for the CTX100-S and CTX100. Also includes input power requirements, cable lengths/network requirements, and grounding requirements.
- **Chapter 4 – Strata CTX670 Installation** covers site requirements and Base and Expansion cabinet installation for the Strata CTX670. Explains how to remove and replace cabinets on installed systems. Also includes input power requirements, cable lengths/network requirements, and grounding requirements.
- **Chapter 5 – Rack Mount Installation** provides installation instructions for the rack-mountable Strata CTX670 Base and Expansion cabinets.
- **Chapter 6 – PCB Installation** provides procedures for Strata CTX system Printed Circuit Boards (PCBs) for installation into universal slots. Includes installation instructions, optional configuration information, and wiring and programming considerations for each PCB.
- **Chapter 7 – ISDN Interfaces** contains an overview of the ISDN hardware with specific information on the ISDN Primary Rate Interface (PRI) and Basic Rate Interfaces (BRI). It includes instructions for installation, hardware requirements, wiring requirements, and some programming considerations.
- **Chapter 8 – T1** provides information on T1/DS-1 interfacing for the Strata CTX.
- **Chapter 9 – IPT** provides installation and hardware information for the IP telephone interface PCB (BIPU-Mxx), the IP telephone (IPT1020-SD) and the add-on module (DADM3120).

- **Chapter 10 – MDF PCB Wiring** contains point-to-point wiring diagrams for connection of telephones, lines, peripheral equipment, and power supplies to the Strata CTX systems.
- **Chapter 11 – Station Apparatus** provides instructions on how to connect telephones to the Strata CTX systems and how to configure and upgrade them for optional features. Procedures for installing direct station selection consoles, PC and conventional attendant consoles, and door phones also appear.
- **Chapter 12 – Peripheral Installation** provides connection procedures for optional peripheral equipment to Strata CTX systems. The instructions include hardware requirements, PCB configuration, interconnection/wiring requirements, and programming considerations.
- **Index**

Conventions

Conventions	Description
Note	Elaborates specific items or references other information. Within some tables, general notes apply to the entire table and numbered notes apply to specific items.
Important!	*Calls attention to important instructions or information.*
CAUTION!	**Advises you that hardware, software applications, or data could be damaged if the instructions are not followed closely.**
WARNING!	Alerts you when the given task could cause personal injury or death.
[DN]	Represents any Directory Number button, also known as an extension or intercom number.
[PDN]	Represents any Primary Directory Number button (the extension number for the telephone).
[SDN]	Represents any Secondary appearance of a PDN. A PDN which appears on another telephone is considered an SDN.
[PhDN]	Represents any Phantom Directory Number button (an additional DN).
Arial Bold	Represents telephone buttons.
`Courier`	Shows a computer keyboard entry or screen display.
"Type"	Indicates entry of a string of text.
"Press"	Indicates entry of a single key. For example: Type **`prog`** then press **`Enter`**.
Plus (+)	Shows a multiple PC keyboard or phone button entry. Entries without spaces between them show a simultaneous entry. Example: **`Esc`**+**`Enter`**. Entries with spaces between them show a sequential entry. Example: **# + 5**.

Conventions	Description
Tilde (~)	Means "through." Example: 350 ~ 640 Hz frequency range.
➢	Denotes the step in a one-step procedure.
➤	Denotes a procedure.
Start > Settings > Printers	Denotes a progression of buttons and/or menu options on the screen you should select.
See Figure 10	Grey words within the printed text denote cross-references. In the electronic version of this document (Library CD-ROM or FYI Internet download), cross-references appear in blue hypertext.

Related Documents/Media

Note Some documents listed here may appear in different versions on the CD-ROM or in print. To find the most current version, check the version/date in the Publication Information on the back of the document's title page.

General Description

- Strata CTX General Description

Programming Manual

- Strata CTX Programming Manual

User Guides

- Strata CTX DKT/IPT Telephone
- Strata CTX DKT3001/2001 Digital Single Line Telephone
- Strata CTX Standard Telephone
- Strata CTX DKT2204-CT/DKT2304-CT Cordless Telephone

Quick Reference Guides

- Strata CTX DKT/IPT Telephone

CD-ROMs

- Strata CTX WinAdmin Application Software and CTX/DK/Partner Products Documentation Library
- Strata CTX Call Center Solutions Application Software and Documentation Library (includes Strata CTX ACD software and documentation, Net Server software and documentation, and Voice Assistant software and documentation)
- OAISYS (includes software and documentation for OAISYS Chat, Call Router, and Net Phone)

For *authorized users,* Internet site FYI (http://fyi.tsd.toshiba.com) contains all current Strata CTX documentation and enables you to view, print and download current publications.

CTX28 Installation 1

This chapter explains how to install the Strata CTX28 system. It includes information on site requirements, wiring diagrams, and step-by-step instructions on how to install the unit(s), the ground wiring, AC power cabling, reserve power (battery backup) cabling, and Printed Circuit Board (PCB) cabling.

Inspection

1. When the system is received, examine all packages carefully and note any visible damage. If any damage is found, do not open the packages. Contact the delivery carrier immediately and make the proper claims.
2. After unpacking (and before installing), check the system against the packing list and inspect all equipment for damage. If equipment is missing or damaged, contact your supplier immediately.
3. Be sure to retain original packaging materials for re-use when storing or transporting system hardware.

Packaging and Storage

CAUTION! When handling (installing, removing, examining) PCBs, do not touch the back (soldered) side or edge connector. Always hold the PCB by its edges.

➤ When packaging and storing the system, remove PCBs from the system cabinet. PCBs should be packaged in their original antistatic bags for protection against electrostatic discharge. Be sure to package equipment in its original shipping containers.

CTX28 FCC/ACTA Registration Numbers

- ACTA/FCC Part 68 Registration for Key System Code (KD): CJ6KD03BDTCHS28
- ACTA/FCC Part 68 Registration for Multifunction Code (MF): CJ6MF03BDTCHS28

Site Requirements

This section defines the installation site requirements necessary to ensure a proper operating environment for the CTX28. Also included are grounding requirements.

Input Power

The system requires an input power source of 115VAC ± 10VAC, 50/60 Hz, 1.5 amps. The AC outlet is recommended to be dedicated and unswitched. (See “AC Power and Grounding Requirements” on page 1-4.)

This eliminates interference from branch circuit motor noise or the like, and to prevent accidental power-off. To avoid accidental power turn-off, Toshiba recommends that you do *not* use an On/Off wall switch on this dedicated AC circuit.

For the Strata CTX28, a reserve power source (HPFB-6) may be connected to the system to serve as a power failure backup (See Step 8 on page 1-18).

Clearance and Location

The minimum clearance requirements for the Strata CTX28 Base cabinet is shown in Figure 1-1. Refer to Figure 1-5 on page 1-7 for CTX28 KSU mounting instructions.

Consider the following conditions when selecting a location for the KSU(s):

The location *must be*:

- Dry and clean
- Well ventilated
- Well illuminated
- Easily accessible

The location *must not be*:

- Subject to extreme heat or cold
- Subject to corrosive fumes, dust, or other airborne contaminants
- Subject to excessive vibration
- Next to television, radio, office automation, or high frequency equipment

If reserve power (HPFB-6) is to be installed for the Strata CTX28, the batteries will require a well-ventilated location close to the CHSU28A.

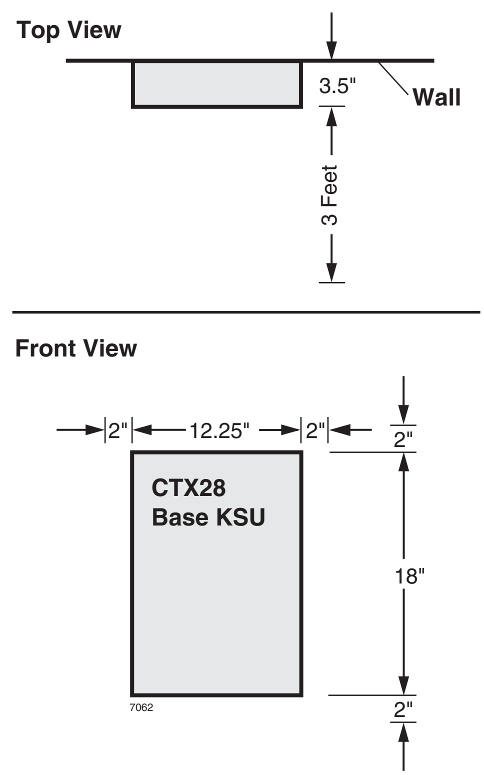


Figure 1-1 CTX28 Base KSU Clearance Requirements

Table 1-1 provides a summary of the electrical and environmental characteristics.

Table 1-1 Summary of Electrical/Environmental Characteristics

CTX28 Primary Power	
Input AC (Power Supply Specification) AC frequency Power AC input current	100~240VAC 50/60 Hz CTX28 - 100 watts maximum 1.5A maximum
Environmental Specifications	
Operating temperature Operating humidity Storage temperature	32~104° F (0 ~40° C) 20~80% relative humidity without condensation -4~140° F (-20~60° C)
Power	
Input DC	15V to use the factory-shipped AC adapter
Power Converter	
DC voltage output specification	-24VDC (-26.3~-28.3VDC) +5VDC (+4.5~+5.5VDC)
Standard Telephone Ring Circuit (GMAU and GSTU)	
Ring Voltage	180V p-p square wave
Ringing capability	1 REN, 1 circuit - one telephone per circuit

AC Power and Grounding Requirements

The CTX28 requires a solid earth ground for proper operation. The AC power cord connects to a standard AC power outlet. The ground for the CTX28 must originate at the building's main power distribution panel and have a solid connection to earth ground. (See Figure 1-2.)

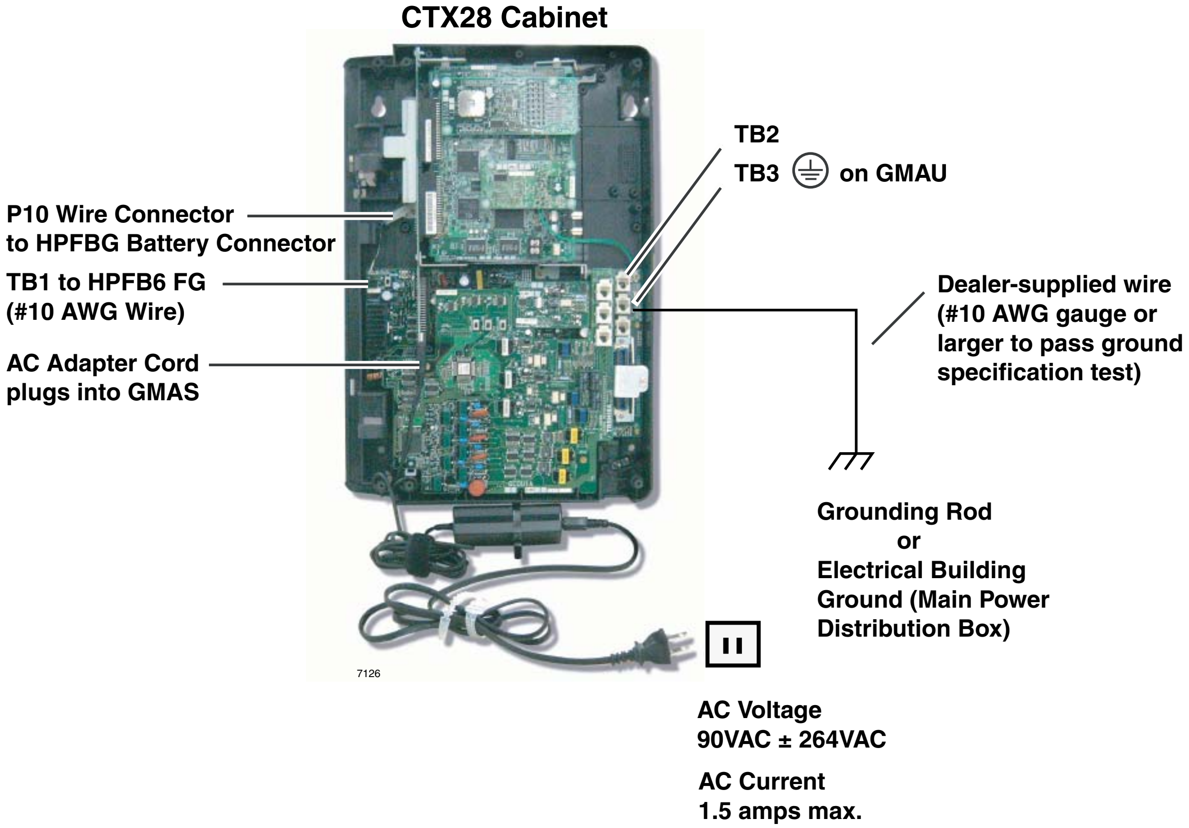


Figure 1-2 Ground to AC Power Cord

CAUTION! **Lack of proper ground may cause improper operation and, in extreme cases, system failure.**

WARNING! **Failure to provide a proper ground may be a safety hazard to service personnel or lead to confusing trouble symptoms, such as noise on the talk path including GVMU greetings and messages. In extreme cases, system failure may result because the system is not properly protected from lightning or power transients.**

AC Power Ground Test

Test the "wire ground" for continuity by either measuring the resistance between the TB3 terminal (earth ground) on the GMAU and a metal cold water pipe (maximum: 1 ohm), or by using a commercially available earth ground indicator. If neither procedure is possible, perform the following earth ground test procedure.

WARNING! Hazardous voltages that may cause death or injury are exposed during the following test. Use great care when working with AC power line voltage.

➤ **To perform the earth ground test procedure**

1. Obtain a suitable voltmeter, and set it for a possible reading of up to 250VAC.
2. Connect the meter probes between the two main AC voltage terminals (white and black wires) on the wall outlet. The reading obtained should be between 100~125VAC.
3. Move one of the meter probes to TB3 terminal (green wire ground). Either the same reading or a reading of zero volts should be obtained.
4. If the reading is zero volts, leave one probe on the ground terminal and move the other probe to the second voltage terminal.

CAUTION! If a reading of zero volts is obtained on both voltage terminals (white wire to TB3 wire, black wire to TB3 wire), the outlet is not properly grounded. Omit Steps 5 and 6, and see following CAUTION!

5. If a reading of zero volts on one terminal, and a reading of 100~125VAC on the other terminal is obtained, remove both probes from the outlet.
6. Set the meter to the "OHMS/Rx1" scale. Place one probe on the TB3 ground terminal, and the other probe on the terminal that produced a reading of zero volts. The reading should be less than one ohm.

CAUTION! If the reading is more than one ohm, then the outlet is not adequately grounded. If the above tests show the outlet AC voltage is not in range or is not properly grounded, the condition should be corrected (per Article 250 of the National Electrical Code) by a qualified electrician before the system is connected.

Table 1-2 Grounding Wiring Summary

Grounding Requirement	From	To	Description
System connects to earth ground	Earth ground	TB3 on GMAU	Less than 1 ohm
FG of HPFB-6 connect to GMAU	HPFB-6 FG Screw	TB1 on GMAU	
HPFB-6 Ground Feed	TB1 on GMAU	TB3 on GMAU	
GETS connects green ground wire to GMAU	GETS ground wire	TB2 on GMAU	

Installing the CTX28 Cabinet

Check the items shipped.

- CHSU28A cabinet
- GCTU1A processor PCB
- AC adapter
- Tie wrap for cable clamp
- Tie wrap for AC adapter
- Velcro strap for AC adapter cord

Step 1: Mount the Cabinet on the Wall

The Base cabinet is designed to be mounted on a wall or other vertical surface.

WARNING! To prevent electrical shock, make sure the power supply switch is turned Off.

➤ **To mount the Base KSU**

1. Make sure the location for the CTX28 meets the minimum clearance requirements specified in Figure 1-1 on page 1-2.
2. Loosen the screws on the front cover and the side cover of the Base KSU, remove the covers (see Figure 1-3).

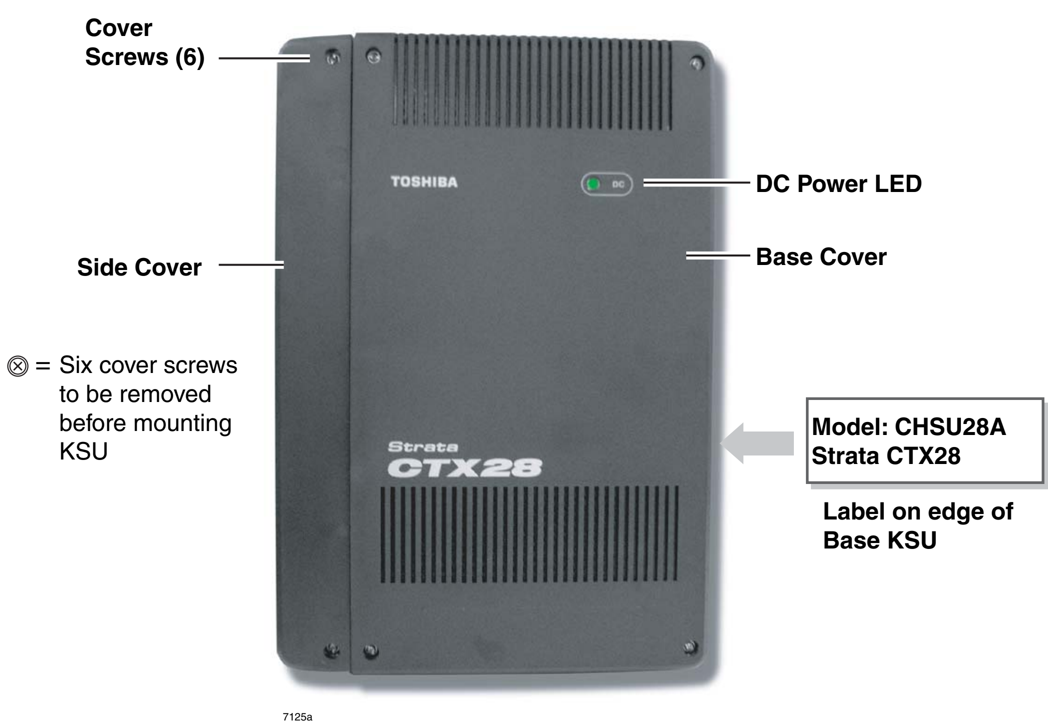


Figure 1-3 CTX28 Cabinet Exterior

3. Place the Base KSU on the desired location on the mounting surface and mark the location of the four screw holes. See Figures 1-4 and 1-5.
4. Using a hard board between the KSU and the wall, secure the hard board to the wall first, making certain that screws are aligned with studs. See Figure 1-5.
5. Drill holes on these marks and secure screws approximately two thirds of the way into the top two holes on the mounting surface.
6. Hang the unit from the top two screws and then secure the top screws completely into the mounting surface.
7. Finish securing the unit to the mounting surface by completely screwing the bottom two screws into the wall.

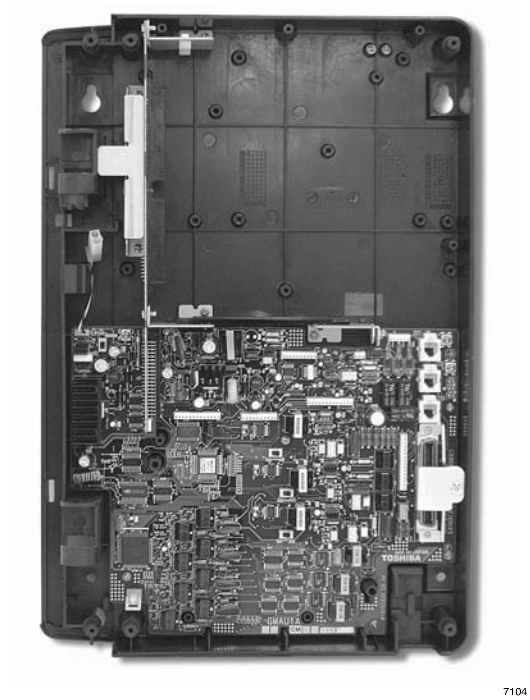


Figure 1-4 CTX28 Base KSU Interior

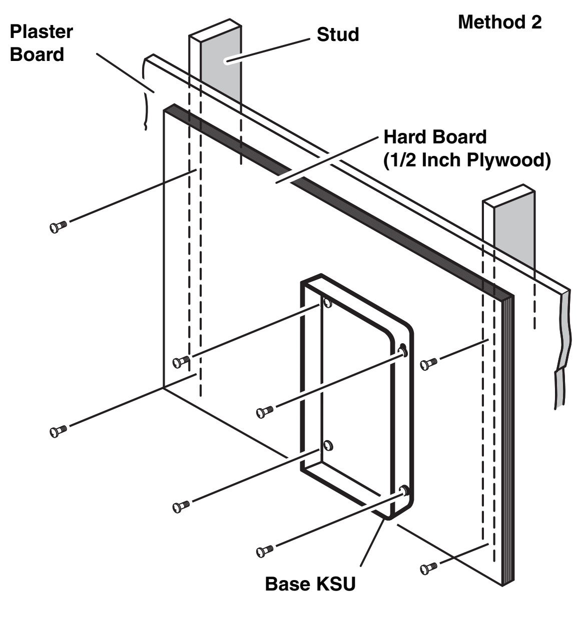


Figure 1-5 KSU Wall Mounting

8. Ground system according to “AC Power and Grounding Requirements” on page 1-4.

PCB Installation

Overview Instructions

The following is an overview for installing the Printed Circuit Boards (PCBs) into the Strata CTX28. After reading this section, proceed to the step-by-step instructions for each PCB.

1. Apply proper settings on the GMAU1A (motherboard Figure 1-7).
2. If applicable, set SW6 battery jumper to ON and install the GVMU1A Voice Mail card (Figures 1-8 and 1-9).
3. Set P601 battery jumper to ON and install the GCTU1A (processor Figures 1-6 and 1-10).
4. If applicable, install the GCDU1A (3 CO, 3 CLID and 8 DKT circuits Figure 1-11).
5. If applicable, install GSTU1A (standard telephone interface Figure 1-12).
6. If applicable, install the GETS1A 100Base-TX I/F PCB (Figure 1-13).
7. If applicable, install the BSIS1A for SMDR (Figure 1-6).
8. If applicable, install HPFB-6 battery/charger (Figure 1-14).
9. Connect wiring (Table 1-14).
10. Connect AC Adaptor to P2 of the CTX28 sub-motherboard (GMAS, Figures 1-15 and 1-16) and plug the AC Adaptor into AC power.
11. Turn the System ON by sliding the SW1 ON/OFF switch down. The ON/OFF LED located by STANDBY will turn on (Figure 1-15).

PCB Descriptions

This describes the CTX28 cabinet PCBs (see Table 1-3 and Figure 1-6.)

Table 1-3 CTX28 (CHSU28) Cabinet circuit cards

Part	Title	Description
GMAU1A	Main Motherboard	The GMAU motherboard supports 3 CO lines, 3 CLIDs, 8 Digital Telephones, 1 Standard Telephone. The GCTU, GVMU, and AC power adaptor plugs into the GMAS sub-motherboard dedicated slots.
GMAS1A	Sub-motherboard	
GCTU1A	Processor	Shipped with cabinet.
GVMU1A	Voice Mail Circuit Card	(Optional) Voice Mail.
GCDU1A	CO, CLID, DKT circuit card	(Optional) Supports 3 CO lines, 3 CLIDs, 8 Digital Telephones. The GCDU1A plugs onto the motherboard.
GSTU1A	Standard Telephone Circuit Card	(Optional) Provides 1 Standard Telephone port.
GETS1A	100BaseT I/F	(Optional) Ethernet 100Base T cable.(optional)
BSIS1A	RS232C	(Optional) RS232-C. Provides 4 serial I/O ports.
HPFB6	External Battery	(Optional) Provides backup Reserve power.

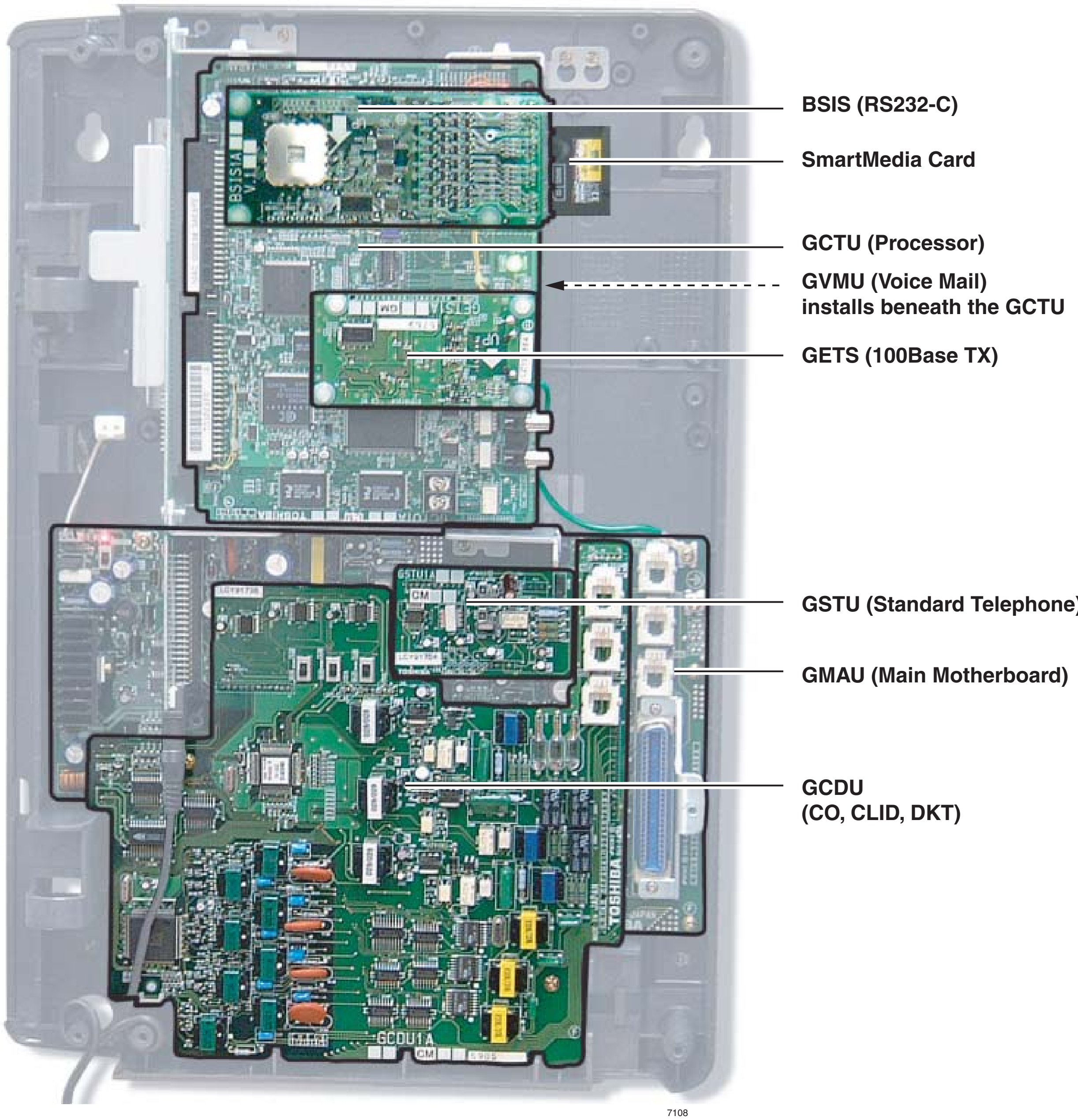


Figure 1-6 CTX28 Interior with PCBs

Step 1: Set Jumpers on the GMAU1A (Motherboard)

The GMAU1A (shown in Figure 1-7) supports up to 6 CO lines with Caller ID (CLID).

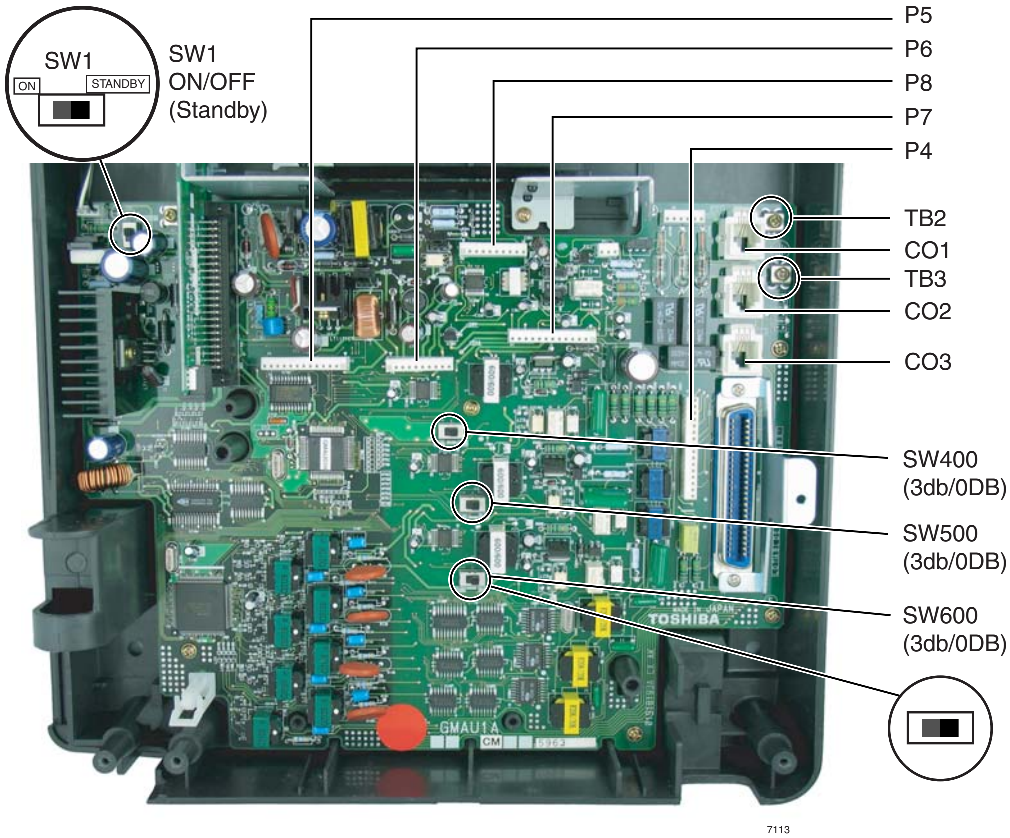


Figure 1-7 GMAU PCB

Table 1-4 GMAU Controls, Switches and Indicators

Control/Indicator/Connector	Type of Component	Description
SW1	2-position slide switch	Power Switch: [STANDBY] = no DC power supply. [ON] = DC voltage supplied. [ON] activates the reserve power from HPFB-6 battery pack.
SW400	2-position slide switch	3dB Pad switch
SW500		
SW600		
CD6	LED	Power indicator; when SW1 is [ON], turned on. Red both AC power and 3Reserve power. SW1 is [STANDBY], turned off.
TB1	Plate with screw	Grounding for HPFB-6 external battery
TB2	Plate with screw	Grounding for GETS Ethernet card
TB3	Plate with screw	Grounding for CTX28 system, connect to earth ground
P1	50-pin Amphenol connector	DKT, SLT and Power Failure Transfer interface
P3	44-pin DIN connector	GMAS interface

Table 1-4 GMAU Controls, Switches and Indicators *(continued)*

Control/Indicator/Connector	Type of Component	Description
P4	16-pin female connector	GCDU DKT and loop start interface
P5	13-pin female connector	
P6	10-pin female connector	
P7	13-pin female connector	GSTU standard telephone interface
P8	10-pin female connector	
P9	6-pin female connector	GCDU interface
P10	3-pin connector	HPFB-6 external battery interface
P11	3-pin female connector	GSTU standard telephone interface
P400	Modular connector	Interface for CO Line circuit (CO1)
P500		Interface for CO Line circuit (CO2)
P600		Interface for CO Line circuit (CO3)
F1	2.0A Fuse	-24VDC Over current protection

Table 1-5 GMAS (Sub-motherboard)

Control/Indicator/Connector	Type of Component	Description
P1	44-pin DIN male connector	GMAU interface
P2	Pin Jack	DC-IN (DC15V) jack
J1	44-pin DIN female connector	GVMU interface
J2	44-pin DIN female connector	GCTU interface
J3		

Step 2: Install the GVMU1A Voice Mail PCB (optional)

1. In the CTX28 cabinet, remove the two screws and the PCB stopper (Figure 1-8).
2. On the GVMU, set the SW6 battery jumper to ON and set the Greeting language switch (Figure 1-9). Default language is “English.” See Table 1-6 for other language settings.
3. Turn off system power and if GCTU is installed remove GCTU before installing the GVMU.
4. Install the GVMU into the lower slot of the GMAS (sub-motherboard) (see Figure 1-8).
5. Install the GCTU per Step 3 and turn system power ON.

Note To program GVMU, refer to *Strata CTX28 Voice Processing Programming Manual* and use XADM4 Admin software.

➤ **To re-initialize GVMU to default data after it has been in use (see CAUTION! below)**

1. Turn off CTX28 system power and uninstall GCTU and GVMU.
2. Remove the GVMU battery jumper for two minutes.
3. Place the GVMU battery jumper back to the ON position, then install the GVMU and GCTU.
4. Turn system power back on.

CAUTION! **Initializing GVMU to default data will erase all Names, Security codes and saved Messages.**

Table 1-6 English/French Greetings Settings on the GVMU1A

Jumper	English	French	English to French	French to English
SW2	OFF	ON	OFF	ON
SW3	OFF	OFF	ON	ON
Jumper	**Admin PC**	**Real Time Debug Monitor**		
SW4	OFF (default)	ON (used for debug information, i.e., log and trace data by TTY.		
SW5	Not used.			
SW6	Battery Jumper – must be in ON position			

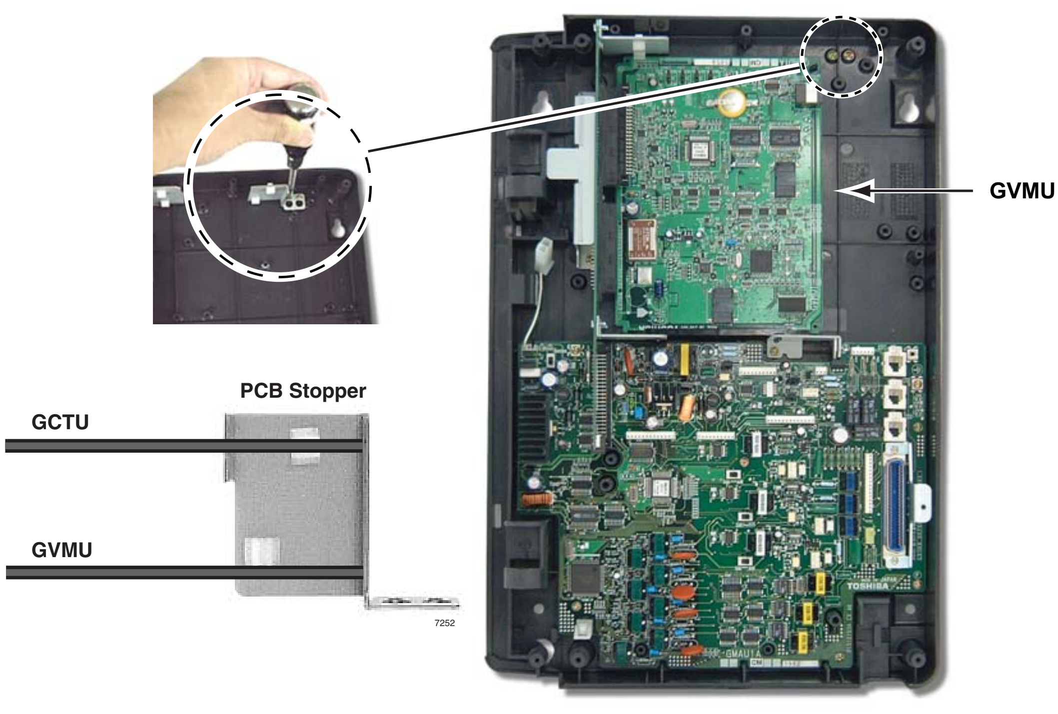


Figure 1-8 GVMU/GCTU PCB Stopper

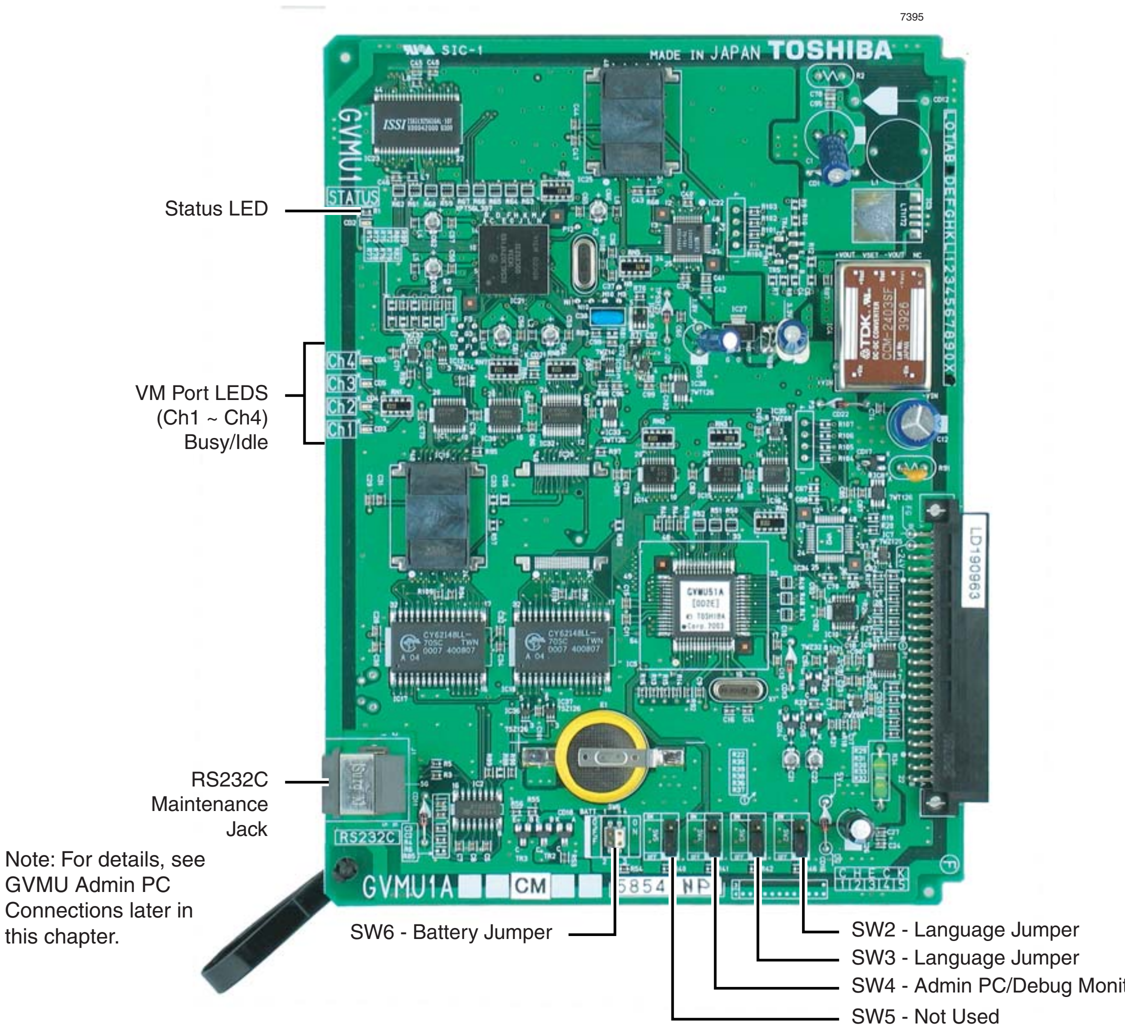


Figure 1-9 Close Up of PCB Stopper for GCTU and GVMU

Table 1-7 LED Indicators on the GVMU1A

Indication/ State	**GVMU1A LEDs**				
	Ch1	**Ch2**	**Ch3**	**Ch4**	**Status**
Power On (Initialize Sequence*)	All LEDs turn ON (Red), then all LEDs turn OFF and cycle ON/OFF through all ports for one to two minutes while initializing and then all LEDs turn off.				
Normal (Busy/Idle)	OFF	OFF	OFF	OFF	Blinking
	ON = Busy; OFF = Idle				
Failure	Blinking	Blinking	Blinking	Blinking	OFF
Shut Down	ON	ON	ON	ON	OFF
Back Up/Restore	ON	ON	ON	ON	ON
No 1.8V input Voltage in GVMU	ON	OFF	OFF	ON	ON
Not mounted/defective	Light flickers and switches from the LED to LED (from Ch1~Ch4) + Status LED				
* The initialize sequence operates each time the CTX28 power is cycled off/on or the CTX28 processor is reset or initialized – GVMU program data remains saved. However, if the GVMU battery jumper is removed, GVMU program data and saved messages will be erased.					

Step 3: Install the GCTU1A (Processor)

The GCTU1A is the main processor for the CTX28. It is shipped with the CTX28 Base cabinet.

➤ To install the GCTU1A into the CTX28

1. Skip this step if you have installed a Voice Mail PCB and already removed the PCB stopper. If you have not done this, then in the CTX28 cabinet, remove the two screws and the PCB stopper (see Figure 1-8).
2. Set the P601 battery jumper to ON (see Figure 1-10) and insert the GCTU1A (shipped with the cabinet) in the upper slot of the GMAS sub-motherboard (see Figure 1-6). Place it next to the guide rail of the PCB stopper (see Figure 1-8).
3. Secure the PCB stopper with the original two screws.
4. Insert the SmartMedia card (gold contacts face left, notched corner faces forward and up) into the SmartMedia slot on the GCTU1A (see Figure 1-6).

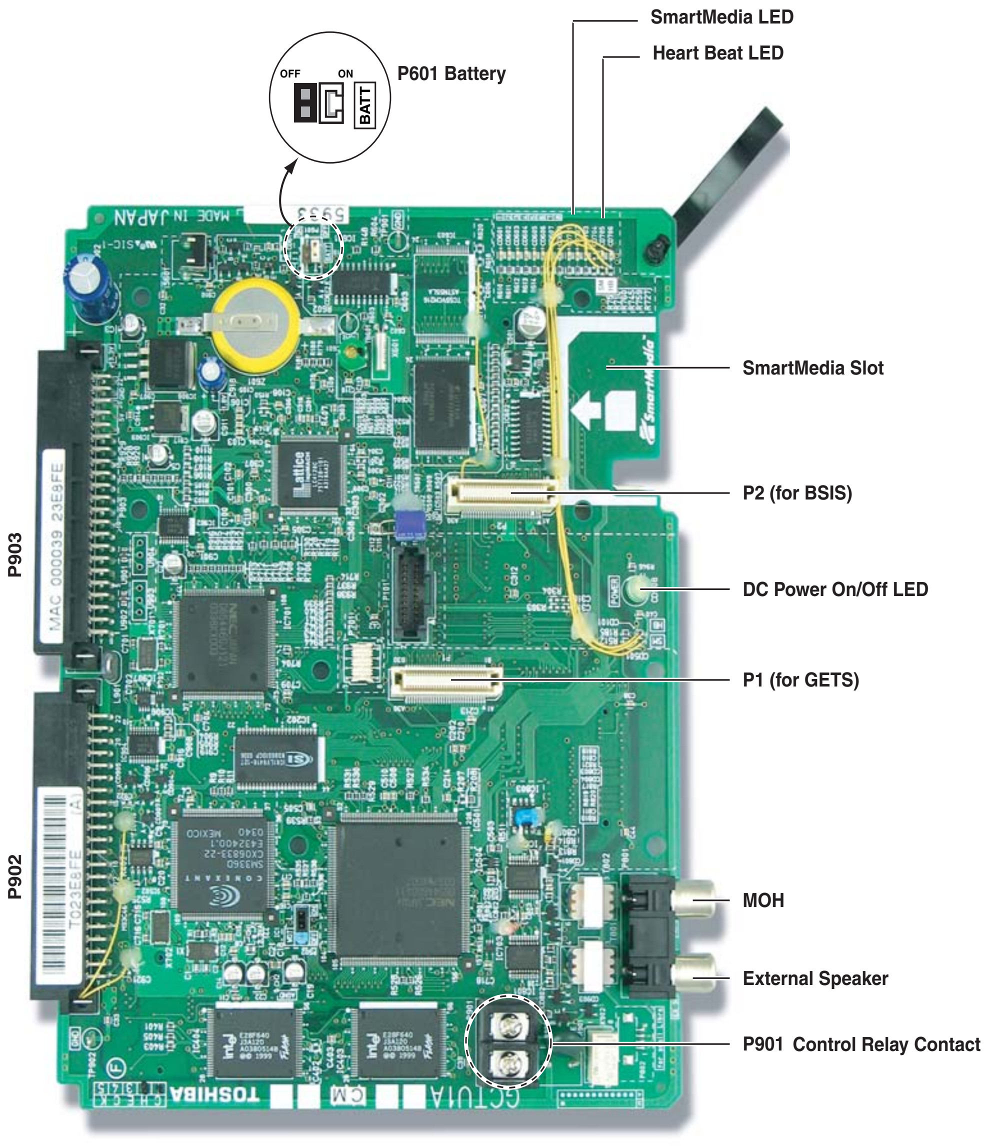


Figure 1-10 GCTU PCB

Table 1-8 GCTU

Control/Indicator/ Connector	Type of Component	Description
P1	60 pin connector	GETS Interface
P2	60 pin connector	BSIS Interface
P501	SmartMedia house	SmartMedia interface
P601	Jumper plug	Must always be in the “ON” position to maintain customer data
P801	RCA Jack	Paging interface and BGM/MOH interface
P901	2 pin screw terminal	Relay contact
P902	44-pin male DIN connector	CTX28 Back plane connector
P903	44-pin male DIN connector	CTX28 Back plane connector
CD101	LED	Processor operation indication
CD501	LED	SmartMedia access indicator
CD908	LED	Green DC power indicator for CTX28 system. Shown on front cover (see Figure 1-3).

Step 4: Install the GCDU1A (DKT and Loop Start Interface)

The GCDU1A PCB adds an additional 3 CO lines, 3 Caller ID units, and 8 digital telephone circuits with a single PCB. It attaches to the GMAU1A motherboard. With the GCDU1A installed, the CTX28 supports up to 16 digital telephones (DKTs), 6 CO lines and 6 Caller ID circuits.

➤ **To install the GCDU1A**

➢ Carefully place the GCDU1A pins over the GMAU connectors (see Figure 1-6 and Figure 1-11). Press down on the PCB to secure the pins to the connectors (see Table 1-9).

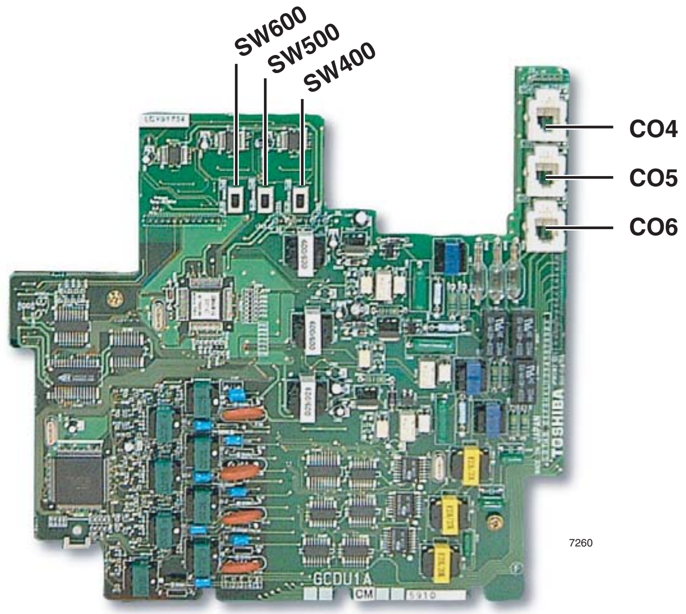


Figure 1-11 GCDU1A PCB

Table 1-9 GCDU1A Controls, Indicators and Connectors

Control/Indicator/ Connector	Type of Component	Description
SW400	2-position slide switch	3dB Pad switch
SW500		
SW600		
P4	16-pin male connector	GMAU interface
P5	12-pin male connector	
P6	9-pin male connector	
P9	6-pin male connector	
P400	Modular connector	Interface for CO Line circuit (CO4)
P500		Interface for CO Line circuit (CO5)
P600		Interface for CO Line circuit (CO6)

Step 5: Install the GSTU1A

The GSTU1A provides one additional standard telephone interface.

➤ To install the GSTU1A, align the GSTU1A pins over the GMAU1A motherboard and press down firmly (see Figure 1-6).

Figure 1-12 GSTU1A PCB

Table 1-10 GSTU1A Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
P7	12-pin male connector	GMAU interface
P8	9-pin male connector	
P11	3-pin male connector	

Step 6: Install the GETS1A

The GETS1A supports 100Base TX Ethernet.

➤ To install the GETS1A

1. Place option PCB arrow side up over the plastic stand-off with the connectors and stand-off holes on the GCTU1A. The "UP" arrow should point down. Snap GETS1A securely into place.
2. Attach the FG ring to TB2 on the GMAU1A motherboard with the screw shown in Figures 1-2 and 1-13.

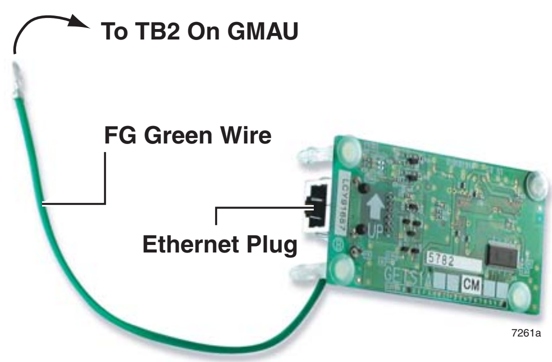


Figure 1-13 GETS (100Base TX)

Table 1-11 GETS (100Base TX)

Control/Indicator/Connector	Type of Component	Description
CD1	LED	LAN link indicator
CD2	LED	Transmission and receive indicator
P1	60 pin connector	GCTU interface
P2	RJ45	Network interface port

Step 7: Install the BSIS1A (optional)

The BSIS provides RS-232 serial ports.

➤ To install the BSIS1A, align the BSIS1A pins over the GCTU1A and press down firmly (see Figure 1-6).

Step 8: Install the HPFB-6 (Reserve Power Battery/Charger)

One or two HPFB-6 optional units can be added to the CTX28 to provide reserve power. The amount of reserve power time depends on the hardware (see Table 1-12). The table below is an estimate of battery backup time based on the premise that the HPFB-6 unit(s) are fully charged at the time of AC power failure. This estimated backup time is based on low call traffic, the time estimates will be reduced by as much as half with extreme heavy traffic volumes.

Table 1-12 CTX28 Reserve Power Duration Estimates

Hardware	1 HPFB-6	2 HPFB-6
3CO/8DKT - No GVMU	1 hr. 40 min.	3 hr. 20 min.
3CO/8DKT - with GVMU	1 hr. 30 min	3 hr.
6CO/16DKT - No GVMU	1 hr. 5 min.	2 hr. 10 min.
6CO/16DKT - with GVMU	1 hr.	2 hr.

1. Place the HPFB-6 directly below the Strata CTX28 KSU. See Figure 1-14 for minimum clearance requirements. A second HPFB-6 can be installed directly below the unit to supply backup reserve power.
2. Mark the location of the two screw holes, then drill holes.
3. Screw the two screws two-thirds into the mounting surface.
4. Hang the HPFB-6 on the screws then tighten the screws into the mounting surface.
5. Plug the first HPFB-6 connector into BATT connector P10 on GMAU.
6. Connect a #10 ground AWG wire from the HPFB-6 “FG” screw to the CTX28 screw labeled “TB1” (Figure 1-2).

Note The CTX28 should be plugged into AC power and the DC power switch should be turned On when installing the HPFU-6. The HPFU-6 will not start to operate if AC power is not available during the initial installation.

7. The 24VDC LED on the HPFB-6 should light. If it does not light, press the battery Off switch with a pencil point or other small-tipped object.
8. Dress and tie-wrap the HPFB-6 cables.
9. To mount a second HPFB-6, repeat Steps 1~4, then plug the second HPFB-6 connector in the first HPFB-6 and connect an FG wire between each HPFB-6 FG screw.
10. To test the HPFB-6, remove the CTX28 AC plug from the AC outlet. The CTX28 AC LED will go out, but the CTX28 DC LED remains on. Also the system remains in normal working order and the HPFB-6 24V LED remains on.
11. If it is desired to turn off the HPFB-6 (after loss of AC power), use a pencil or other sharp object to press the Battery Off switch.

CAUTION! **Once the HPFB-6 is turned Off or unplugged (during AC power loss) it will not operate again until AC power is restored to the CTX28 KSU.**

Note **The CTX28 KSU does not provide a battery charger, the HPFB-6 contains built-in batteries and a battery charger; therefore, do not connect any other type of batteries to the CTX28.**

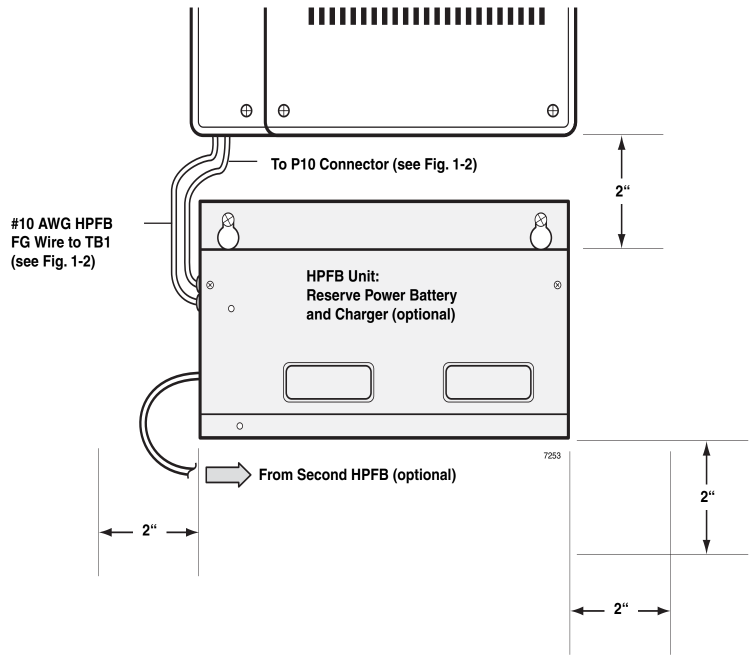


Figure 1-14 HPFB-6 Reserve Power Installation

Step 9: Install Wiring

1. Refer to Figure 1-15 for the following steps. Loosen the screw on the Amphenol clamp and remove the clamp. Plug in the 25-pair Amphenol connector and replace the clamp to hold the Amphenol connector in place.
2. Connect all other PCB wiring (e.g., modular CO line cords, LAN cable, etc.). Slide the shorter tie-wrap through the holder. Then fasten wiring to the unit with the tie wrap that comes with the Base KSU.
3. Connect the end of the AC adapter cable to the GMAS PCB as shown in Figures 1-15 and 1-16.
4. Connect the other end of the GETS (100Base TX) LAN cable to the LAN connected to the CTX WinAdmin PC.
5. Plug the AC adapter into a power strip connected to an power outlet.
6. Put the On/Standby switch into “On” position. The DC LED should light green. The CTX28 is now ready to program.

WARNING!	**Do not smoke near batteries. Avoid creating any electrical sparks near batteries.**

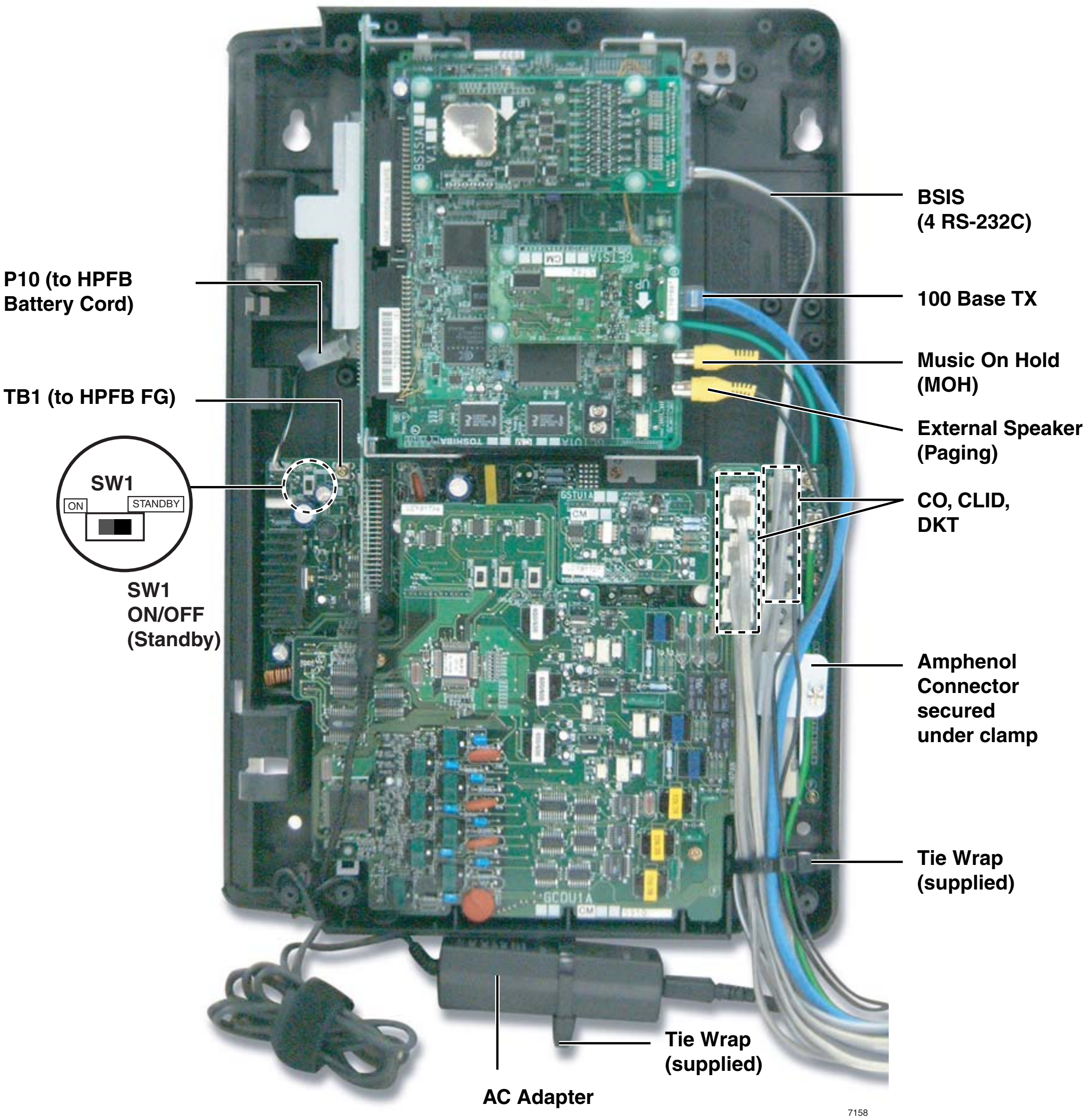


Figure 1-15 Standard Unit Wiring (without option units) and AC Adapter

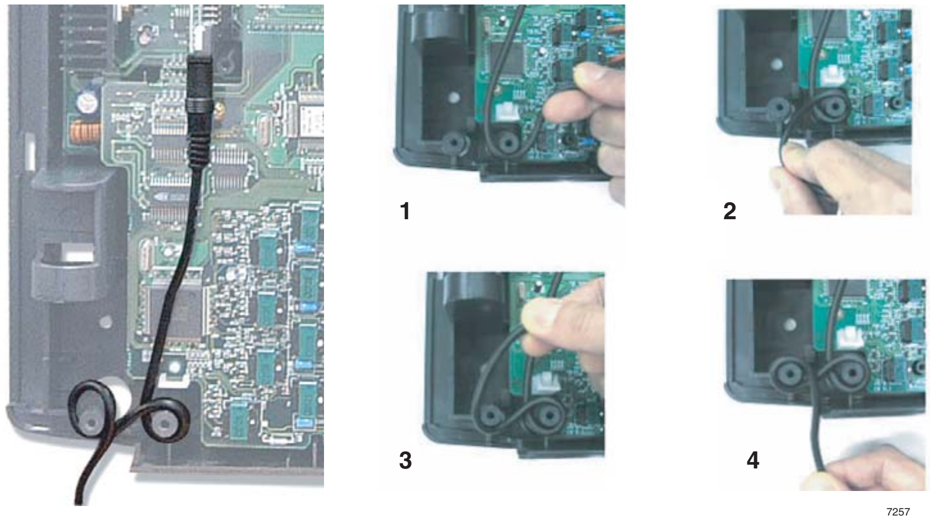


Figure 1-16 AC Adapter Wiring Procedure

Digital Telephone Connection

The Strata CTX28 supports any Toshiba 2000 and 3000-series digital telephones, including the new DKT3007-SD telephone (shown right).

The DKT3007-SD only works on the CTX28.

The DKT3007-SD works just like the DKT3020-SD and DKT3010-SD, except that it has seven flexible buttons.

The CTX28 supports all DKT2000 and DKT3000-series Add-on Modules and DSS Consoles.

CTX28 supports Handset Off-hook Call Announce (OCA), but not Speaker OCA.

Figure 1-17 DKT3007-SD Telephone

Loop Limits

This section provides the maximum loop lengths for connection of telephones, lines, peripheral equipment, and power supplies. The following information applies to only the Strata CTX28 system (see Table 1-13). Diagrams that are applicable to all systems, including the CTX28, can be found in Chapter 10 – MDF PCB Wiring.

Table 1-13 Digital Telephone/DIU/DDSS Console/ADM/Loop Limits

<table>
<tr><th rowspan="3">Mode</th><th rowspan="3">CTX28 KSU or Battery Backup[1]</th><th colspan="3">Maximum line length (24 AWG)</th></tr>
<tr><th colspan="2">1 Pair</th><th rowspan="2">1 Pair plus external power[2]</th></tr>
<tr><th>feet</th><th>meters</th></tr>
<tr><td rowspan="2">DKT3000-series or DKT2000-series models, DKT with BVSU or DVSU or BHEU or HHEU.</td><td>CTX28 KSU</td><td>1000</td><td>303</td><td rowspan="14">1000 feet
303 meters</td></tr>
<tr><td>Battery Backup</td><td>695</td><td>204</td></tr>
<tr><td rowspan="2">DKT with BPCI</td><td>CTX28 KSU</td><td>1000</td><td>303</td></tr>
<tr><td>Battery Backup</td><td>500</td><td>151</td></tr>
<tr><td rowspan="2">DKT with BPCI and BHEU</td><td>CTX28 KSU</td><td>1000</td><td>303</td></tr>
<tr><td>Battery Backup</td><td>500</td><td>151</td></tr>
<tr><td rowspan="2">DDSS3060 or 2060</td><td>CTX28 KSU</td><td>1000</td><td>303</td></tr>
<tr><td>Battery Backup</td><td>675</td><td>204</td></tr>
<tr><td rowspan="2">DDCB3A</td><td>CTX28 KSU</td><td>165</td><td>50</td></tr>
<tr><td>Battery Backup</td><td>500</td><td>151</td></tr>
<tr><td rowspan="2">BATI, RATI</td><td>CTX28 KSU</td><td>1000</td><td>303</td></tr>
<tr><td>Battery Backup</td><td>1000</td><td>303</td></tr>
<tr><td rowspan="2">DKT with 1 ADM</td><td>CTX28 KSU</td><td>675</td><td>204</td></tr>
<tr><td>Battery Backup</td><td>165</td><td>50</td></tr>
<tr><td rowspan="2">DKT with 2 ADMs</td><td>CTX28 KSU</td><td>500</td><td>151</td><td></td></tr>
<tr><td>Battery Backup</td><td>33</td><td>10</td><td></td></tr>
</table>

1. Battery backup applies to instances when the system is being powered by batteries exclusively.
2. Digital cable runs must *not* have the following:
   Cable splits (single or double)
   Cable bridges (of any length)
   High resistance or faulty cable splices

CTX28 Secondary Protection

The following diagram (see Figure 1-18) shows where secondary protectors must be installed for outside wiring.

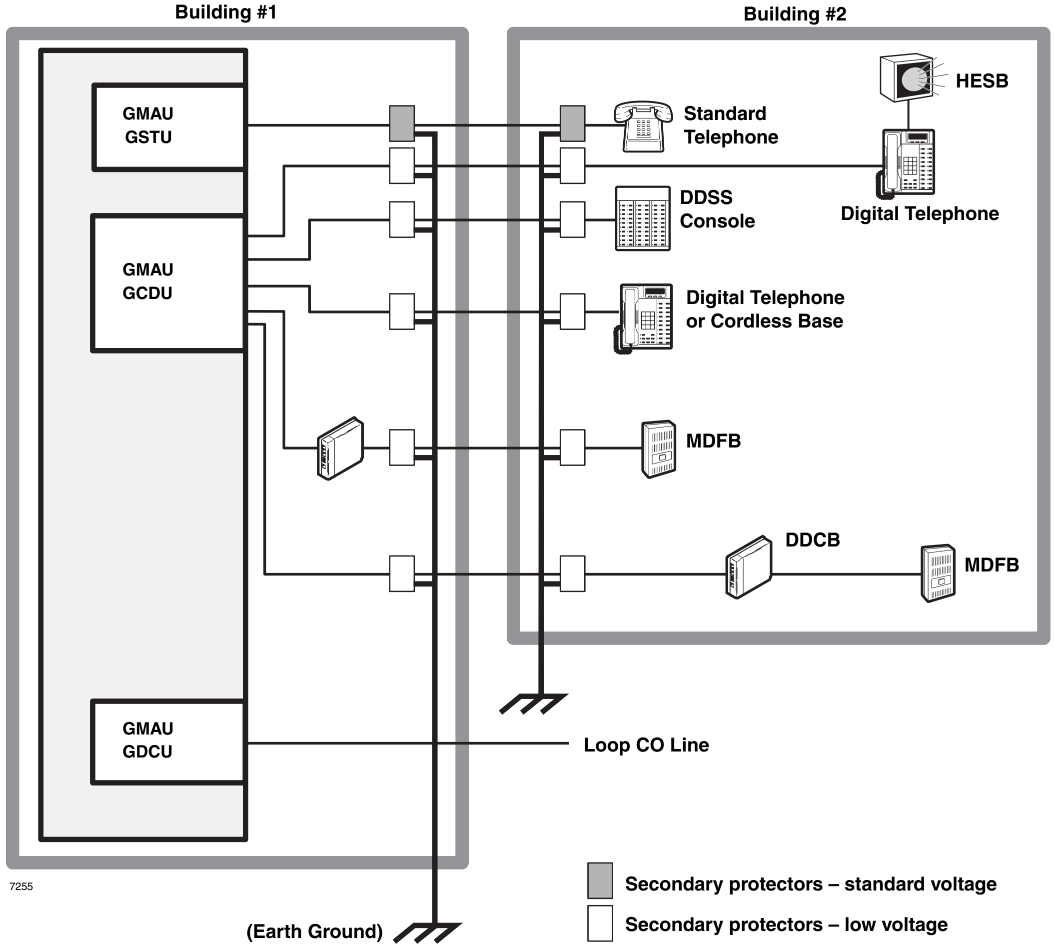


Figure 1-18 CTX28 Secondary Protector Diagram

Important! *To protect against transient voltages and currents, solid state secondary protectors must be installed if there is outside wiring. These protectors, which contain fast semiconductors in addition to fuses, shall comply with the requirements for secondary protectors for communication circuits, UL 497A. Care must be taken to ensure that they are very well grounded to a reliable earth ground. Recommended protectors are available in the fast Series 6 line from ONEAC Corp., Libertyville, Illinois 60048, (800) 327-8801. Install and test the secondary protectors precisely to the installation instructions of these manufacturer.*

MDF Wiring

For Registration information refer to "CTX28 FCC/ACTA Registration Numbers" on page 1-1.

Table 1-14 Station Wiring for Amphenol Connector (P1) on GMAU1

Pin No.	Signal	Pin No.	Signal	Station
1	VR1	26	VT1	DKT #1
2	VR2	27	VT2	DKT #2
3	VR3	28	VT3	DKT #3
4	VR4	29	VT4	DKT #4
5	VR5	30	VT5	DKT #5
6	VR6	31	VT6	DKT #6
7	VR7	32	VT7	DKT #7
8	VR8	33	VT8	DKT #8
9	VR9	34	VT9	DKT #9
10	VR10	35	VT10	DKT #10
11	VR11	36	VT11	DKT #11
12	VR12	37	VT12	DKT #12
13	VR13	38	VT13	DKT #13
14	VR14	39	VT14	DKT #14
15	VR15	40	VT15	DKT #15
16	VR16	41	VT16	DKT #16
17	(NC)	42	(NC)	
18	PF1R	43	PF1T	PFT circuit*
19	(NC)	44	(NC)	
20	(NC)	45	(NC)	
21	(NC)	46	(NC)	
22	(NC)	47	(NC)	
23	CR1	48	CT1	STU #1
24	(NC)	49	(NC)	
25	CR2	50	CT2	STU #2

* Connect a Standard Telephone to PFT pair to provide access to CO Line1 during a power failure.

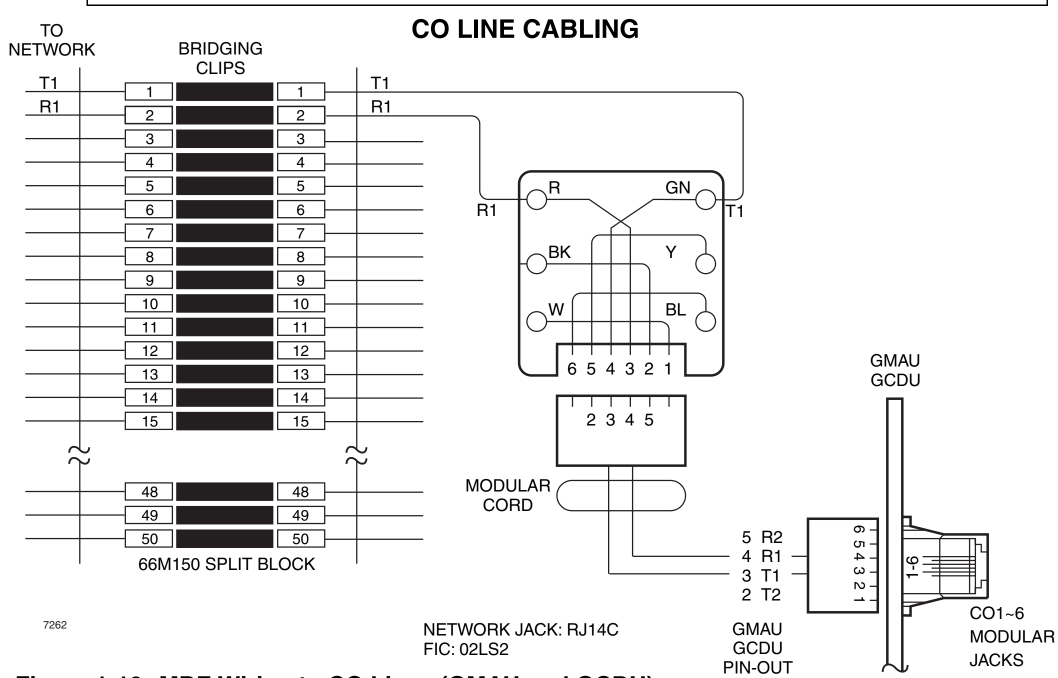


Figure 1-19 MDF Wiring to CO Lines (GMAU and GCDU)

GVMU Administration PC Connections

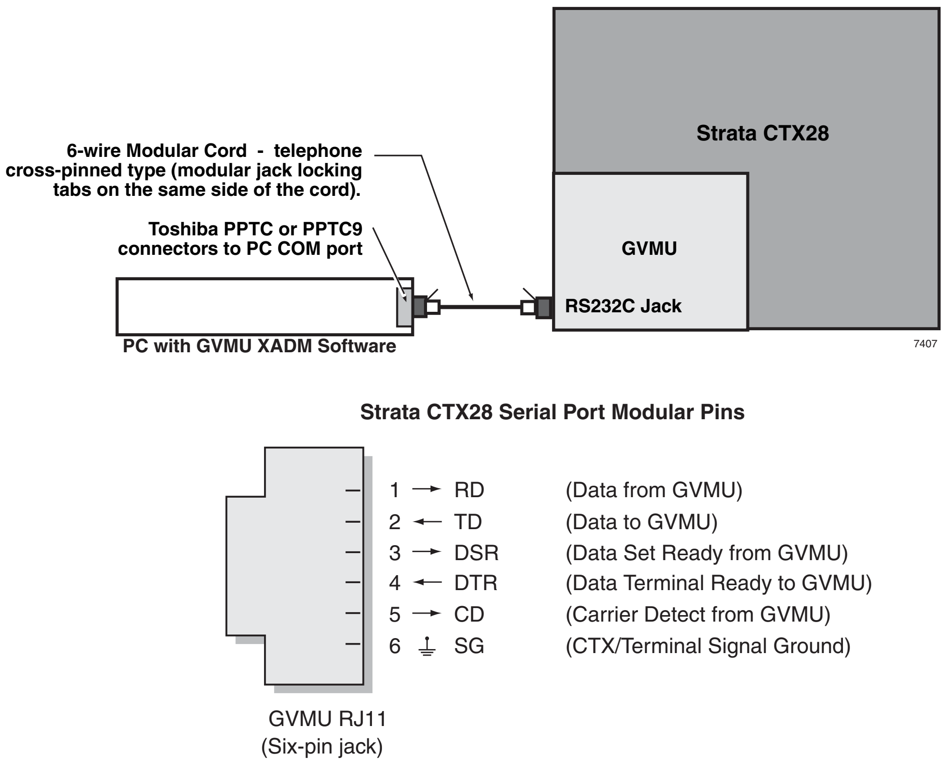


Figure 1-20 GVMU Serial Port Interface Connection

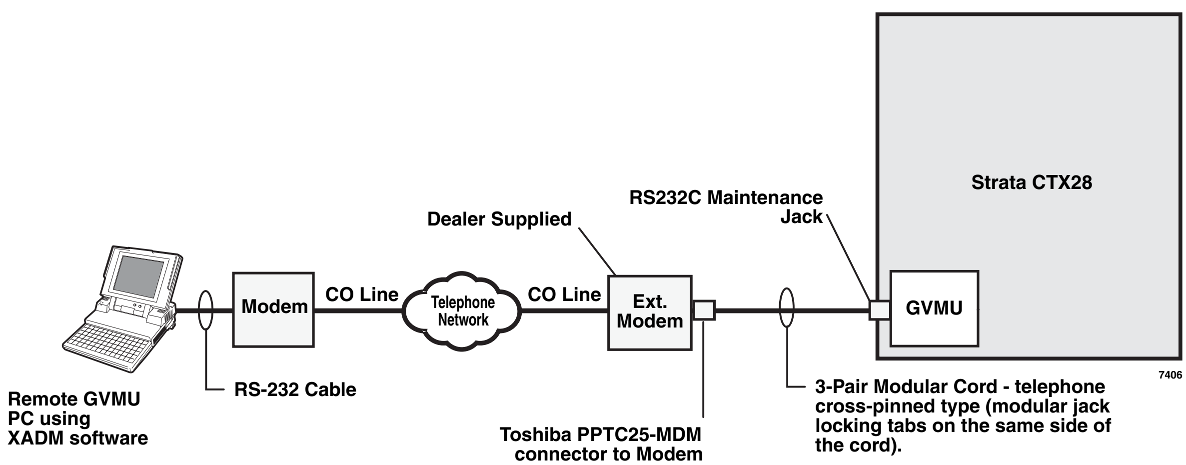


Figure 1-21 GVMU PC Modem Interface Connection

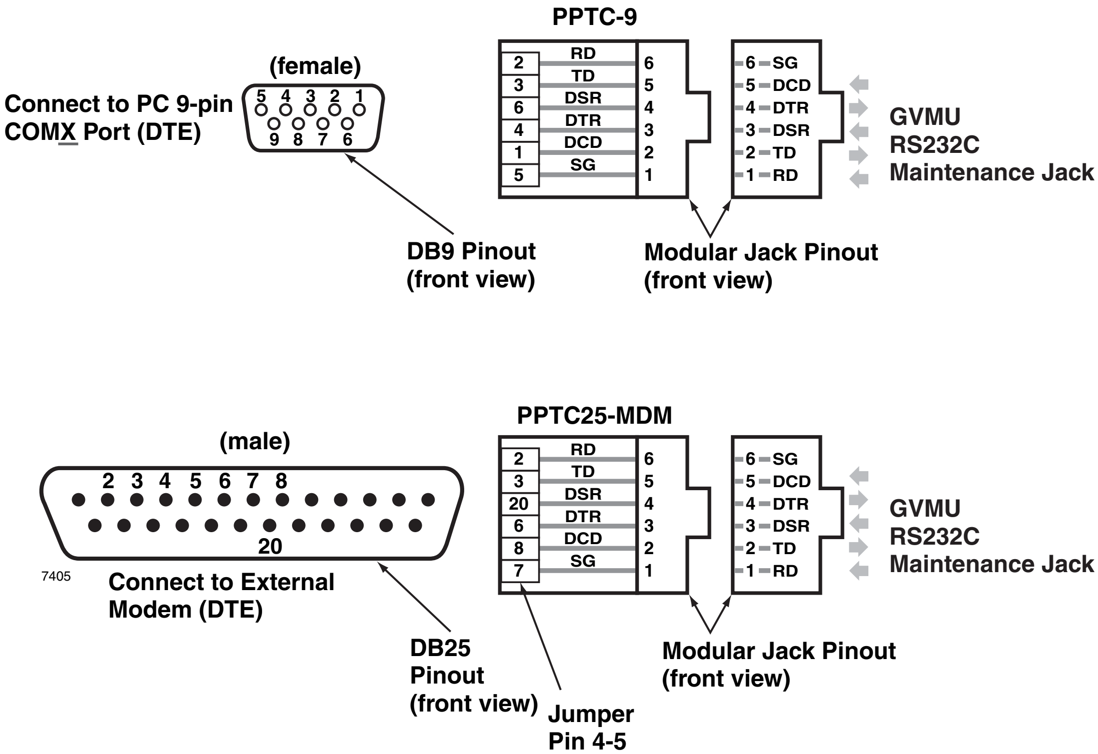


Figure 1-22 Serial Port Adaptors Pin Numbers

Strata CTX Configuration 2

This chapter contains information and worksheets to help configure the Strata CTX100-S, CTX100 and CTX670 hardware components. A system overview of the Strata CTX100-S, CTX100 and Strata CTX670 hardware components and the maximum station and line capacities available with the system processor is provided.

Worksheets follow this information to aid in determining the actual cabinets and interface PCBs needed for particular proposals and how these PCBs should be placed in Strata CTX cabinet slots. (Worksheets begin on page 2-22.)

Strata CTX100-S/CTX100 Overview

The Strata CTX100-S/CTX100 systems are compact systems, yet they provide large system features (see Figure 2-1 and Table 2-1). It is designed for wall mounting and occupies very little space.

They are designed for wall mounting and occupy very little space.

The CTX100 processor (ACTU2A) comes with 32 ports (licensed) and can grow to 112 ports by adding 4-port licenses.

The CTX100-S processor (ACTU2A-S) comes with 16 ports (licensed) and can grow to 32 ports by adding two eight-port licenses. Then, it can grow to 112 ports with four-port licenses.

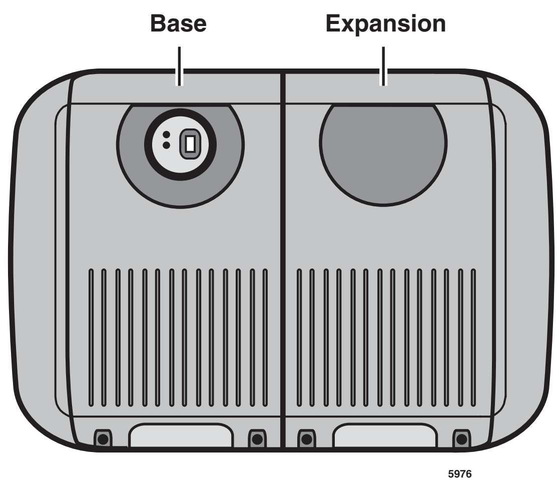


Figure 2-1 CTX100-S /CTX100 Base/Expansion Cabinets

Note The Strata CTX100-S and CTX100 system capacities depend on the licenses stored on the system processor and the hardware described in this chapter. See "CTX100-S/CTX100 License Control" on page 2-4.

Important! *The Strata CTX100-S uses the same hardware and configuration as the Strata CTX100, with a few exceptions. Whenever the CTX100 is mentioned in this book, it applies to both the CTX100-S and CTX100, unless specified otherwise.*

Each ACTU2 basic processor can be configured with a one or two cabinet system. A single (Base) cabinet system supports a combination of up to 64 Central Office (CO) lines and stations, while a two cabinet system (Base and Expansion) can support up to 112 CO lines and stations.

System line and station capacity is expanded by adding CO line and station Printed Circuit Boards (PCBs) and port licenses into its universal slot architecture.

The CTX100 easily connects to outside public and private telephone lines. All of the telephones (stations) tied to the system can have direct access to each other, as well as to the public and private network. All lines, stations, and options are tied together through the cabinets.

Table 2-1 CTX100-S / CTX100 Cabinet Specifications

Cabinet	Weight[1]	Height	Width	Depth
Base Cabinet (CHSUB112A)	19.4 lbs.	14.6 in.	11.9 in.	10.2 in.
Base + Expansion Cabinet (CHSUE112A)	34.6 lbs.	14.6 in.	19.9 in.	10.2 in.

1. Weight includes the processor PCB in the Base Cabinet and four universal PCBs in each cabinet.

CTX100-S and CTX100 Processors

Each system operates with one processor PCB (ACTU2A-S for CTX100-S, ACTU2A for CTX100) that installs in a dedicated slot of the Base Cabinet. The processors incorporate the following hardware features

CPU/Memory

Either processor PCB uses a high-speed, 32-bit, RISC processor, Dynamic Random Access Memory (DRAM) working memory, Static Random Access Memory (SRAM) with lithium battery for memory back-up, and flash program memory.

Large Scale Integrated (LSI) Circuits

The processors each have LSI circuits that support the following:

- 16 DTMF receiver hardware processor are built into the ACTU2. Five or more DTMF receivers requires appropriate licenses. See "CTX100-S/CTX100 License Control" on page 2-4.
- 16 Busy Tone (BT) detector circuits for Auto Busy Redial (ABR) are built into the ACTU2.
- 64 built-in conference circuits (see Table 2-7 on page 2-12 for more information).
- Built-in, adjustable, digital volume PAD technology enables audio volume to be adjusted in eight steps to compensate for conference and/or CO line network losses.

Memory Protection Battery

If commercial AC power is lost or if a system is moved or stored without power, either processor has an on-board battery that protects data and the customer's programmed configuration from memory loss. This information will be maintained in a powerless system for at least six years.

Relay Control Interface

An on-board terminal strip provides an interface to a normally open relay contact which can be programmed to control a Night Bell, door lock or to mute BGM during an external page.

External Page Interface

A 600 ohm RCA jack is built into the processor to interface with a Toshiba External Amplified Speaker (HESB) or a customer-supplied page amplifier and speaker(s) for external paging, night ring over external page, and external BGM applications.

Music-on-hold/Background Music Interface

A 600-ohm RCA jack and volume controls are built into the processor to interface with Music-on-hold and/or Background Music (BGM) sources (one of the jacks is for future use). With the CTX100, you can have up to 15 MOH/BGM source interfaces by adding:

- Up to two BIOU PCBs, each provides three MOH/BGM input sources
- An RSTU PCB that provides up to eight MOH/BGM input sources
- An ASTU PCB provides one alternate BGM source

SmartMedia Memory

Each processor has an on-board SmartMedia™ memory card slot. A SmartMedia flash memory card can be inserted into the slot to backup and restore customer program data. It also makes it easy to upload operating system data for software upgrades and is used for maintenance functions.

CTX100 Processor Optional Subassemblies

Optional subassemblies can be attached to the ACTU2A-S or ACTU2A processors to provide additional features. The subassemblies are:

- **AMDS (Modem**) – Provides a 33.6Kbps/V.34 modem for point-to-point local or remote connection to the CTX WinAdmin™ administration PC.
- **BSIS (Serial Port Interface)** – Provides up to two RS-232 interface ports for SMDR interface to Call Accounting devices, SMDI or Toshiba Proprietary interface to Voice Mail devices, and two future applications.

CTX100 Cabinet Slots

Base Cabinet

The Base Cabinet has one dedicated slot used for the system processor PCB and four universal slots (S101~S104), that can accommodate station, line or option PCBs. It also houses a power supply that is packaged with the cabinet.

Expansion Cabinets

One expansion cabinet provides four universal PCB slots (S105~S108) that can accommodate station, line or option PCBs. It also houses a power supply that is packaged with the cabinet.

CTX100-S/CTX100 License Control

The system size and feature capability is controlled using a software License Key Code. This key code is obtained from Toshiba Internet FYI during the ordering process and is installed onto the system processor via Strata CTX WinAdmin. Processor license codes activate system hardware capacities in the following increments.

- The first 16 line/station ports on the CTX100-S do not require a license. The upgrade from 16 to 24 ports and from 24 to 32 ports requires the eight port upgrade LIC100S-8 PORTS license. Each additional set of 4 line/station ports requires the four port upgrade LIC100-4 PORTS license.
- The first 32 line/station ports on the CTX100 do not require a license. Each additional set of four line/station ports requires one LIC100-4 PORTS license (maximum of 112 ports).
- The ACTU2A-S and ACTU2 processors each provide 16 DTMF built-in receiver hardware circuits and 16 ABR circuits. The first four DTMF circuits and *all* ABR circuits do not require a license. Each additional set of four DTMF receiver circuits requires one LIC100-4DTMF license (maximum of 16 DTMF circuits).

Note DTMF tone receiver circuits are required for standard telephones, Voice Mail DTMF integration, Tie, DID and DNIS line service.

- The optional RS-232 serial port interface (BSIS) provides two circuits to interface with SMDI or Toshiba Proprietary Voice Mail integration, Call Accounting SMDR, and two for future applications. The first circuit does not require a license, but circuits two through four each require one LIC100-SER PORT license.

Licensed Software Options

Some software options are activated with license codes. The following software options require a license:

- Each CTX system (node) in a Strata Net QSIG Network (ISDN or IP) requires one LIC100-QSIG NET license. A maximum of four serial network nodes are allowed in any one serial chain in the network topology.
- The built-in LAN interface for all CTI Open Architecture applications. Each individual CTI Open Architecture application requires one LIC100-CSTA AP license (maximum nine).

Strata CTX670 Overview

The Strata CTX670 system provides sophisticated telecommunication features in a modular system designed for growth. Its universal slot architecture enables you to select the combination of Central Office (CO) lines, stations, and peripheral options that best suit your needs.

The CTX670 basic BCTU processor can be configured for smaller systems as a one or two cabinet system with a capacity of up to 192 CO lines and stations combined. It can expand to support up to seven cabinets with a capacity of up to 672 CO lines and stations combined with the BCTU/BEXU processors (see Figure 2-2).

System line and station capacity is expanded by adding processor expansion Printed Circuit Boards (PCBs), cabinets and line/station PCBs.

The CTX670 easily connects to outside public and private telephone lines. All of the telephones (stations) tied to the system can have direct access to each other as well as to the public and private network.

Note The Strata CTX670 system capacities depend on the licenses stored on the system processor and the hardware described in this chapter. See "CTX670 License Control" on page 2-7.

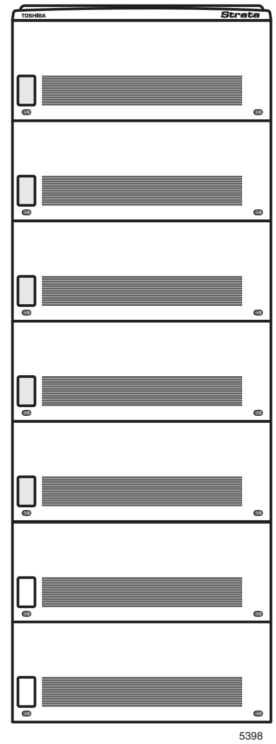


Figure 2-2 CTX 670 Base/ Expansion Cabinets

The Base Cabinet and optional Expansion Cabinets are the building blocks of the system. Each system has a Base Cabinet, and can have from one to six Expansion Cabinets. All lines, stations, and options are tied together through the cabinets.

The overall weight and dimensions of the CTX670 cabinets are shown in Table 2-2.

Table 2-2 CTX670 Cabinet Specifications

Cabinet	Weight	Height	Width	Depth
Base Cabinet (CHSUB672A)	31 lbs.	11.625 in.	26.5 in.	10.3 in.
Expansion Cabinet (CHSUE672A)	29 lbs.	9.75 in.	26.5 in.	10.3 in.

CTX670 Processor PCBs

The system operates with the BCTU only or the BCTU and BEXU processor PCBs install in dedicated slots of the Base Cabinet. The BCTU and BEXU processor incorporates the following on-board hardware features:

CPU/Memory

The CTX670 uses a high-speed, 32-bit, Reduced Instruction Set Computing (RISC) processor, Dynamic Random Access Memory (DRAM) working memory, Static Random Access Memory (SRAM) with lithium battery for back-up memory, and flash program memory.

Large-scale Integrated (LSI) circuits

The processor has LSI circuits that support the following:

- BCTU provides 16 built-in DTMF receivers; 32 available using the BCTU and BEXU. For five or more DTMF receivers, appropriate licenses are required. See “CTX670 License Control” on page 2-7.
- BCTU provides 16 built-in Busy Tone (BT) detectors for Auto Busy Redial (ABR); 32 available using the BCTU and BEXU.
- BCTU provides 64 built-in conference circuits; up to 96 conference circuits are available using the BCTU and BEXU. (See Table 2-7 on page 2-12 for more information).
- Built-in, adjustable, digital volume PAD technology enables audio volume to be adjusted in eight steps to compensate for conference and/or CO line network losses.

Memory Protection Battery

If commercial AC power is lost or if a system is moved or stored without power, the processor has an internal battery that protects data and the customer’s programmed configuration from memory loss. This information will be maintained in a powerless system for at least six years.

Music-on-hold/Background Music Interface

An RCA jack and volume control are built into the processor to interface with a Music-on-hold and/ or Background Music source. With the CTX670, you can have up to 15 MOH/BGM sources by adding:

- Up to two BIOU PCBs, each provides three MOH/BGM input sources.
- An RSTU PCB that provides up to eight MOH/BGM input sources.
- MOH/BGM source volume adjustment is controlled by software programming.

SmartMedia Memory

The processor has an on-board SmartMedia card slot. A SmartMedia flash memory card can be inserted to backup and restore customer program data. It also makes it easy to upload operating system data for software upgrades and is used for maintenance functions.

Network Interface

The processor has an on-board Ethernet 10base-T Ethernet circuit for connection to Open Architecture Computer Telephony Interface (CTI) applications. This provides extensive call control and telephone support for CTI applications. The Ethernet Network Interface Card (NIC) port also enables connection to the following:

- CTX Attendant Console
- ACD server
- Local and Remote CTX WinAdmin PC
- Soft Key Control of Voice Mail features

CTX670 Processor PCB Subassemblies

Subassemblies can be added to the BCTU processor PCB to provide additional features. The subassemblies are:

- AMDS (Modem) – Provides a 33.6Kbps/V.34 modem for point-to-point local or remote connection to the CTX WinAdmin™ administration PC.
- BSIS interface PCB which attaches to the BCTU to provide up to four RS-232 interface ports for SMDR Call Accounting and SMDI or Toshiba Proprietary Voice Mail interface.

See Table 2-3 on page 2-9 for the number of cabinets and universal PCB slots for the Basic and Expanded systems.

CTX670 License Control

The system size and feature capability is controlled using a software License Key Code. This key code is obtained from the Toshiba Internet FYI site during the ordering process and is installed onto the system processor via Strata CTX WinAdmin. Processor license codes activate system hardware capacities in the following increments.

- The first 64 line/station ports do not require a license. Each additional set of four line/station ports requires one LIC670-4PORTS license (maximum of 672 ports).
- The on-board DTMF receiver circuit provides up to 32 DTMF receiver hardware circuits. The first four DTMF circuits do not require a license. Each additional set of four DTMF receiver circuits requires one LIC670-4DTMF license (max. total of 32 DTMF circuits).

Note DTMF tone receiver circuits are required for standard telephones, Voice Mail DTMF integration, Tie, DID and DNIS line service.

- The optional RS-232 serial port interface (BSIS) provides two circuits to interface with Voice Mail SMDI or Toshiba Proprietary Voice Mail integration, Call Accounting SMDR, and two for future applications. The first circuit does not require a license, but circuits two through four each require one LIC670-SER PORT license.

Licensed Software Options

Some software options are activated with license codes. The following software options require a license:

- Each CTX system (node) in a Strata Net QSIG Network requires one LIC670-QSIG NET license. A maximum of four serial network nodes are allowed in any one serial chain in the network topology.
- Each individual CTI Open Architecture application requires one LIC670-CSTA AP license (maximum nine).

CTX670 Cabinet Slots

Base Cabinet

The Base Cabinet has two dedicated slots used for the system processor PCBs and eight universal slots, labeled “S101~S108,” that can accommodate station, CO line or option PCBs (see Figure 2-3). It also houses a power supply.

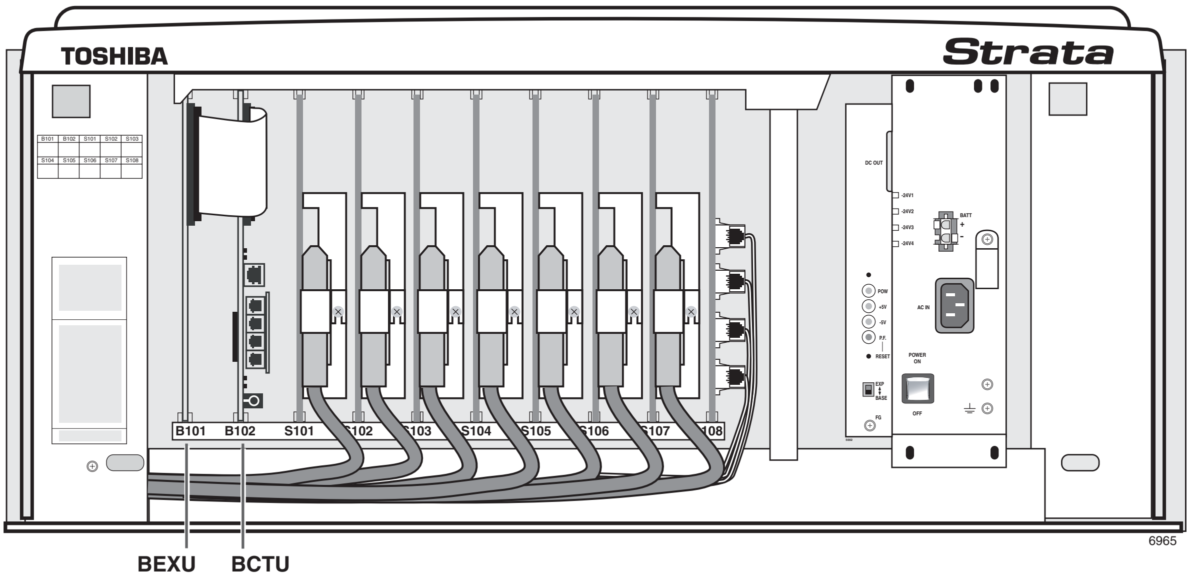


Figure 2-3 Strata CTX670 Base Cabinet Interior

Expansion Cabinets

One to six Expansion Cabinets can be added to increase the system station and CO line capacity. Each expansion cabinet provides 10 slots (S_01~S_10). Figure 2-4 shows an Expansion Cabinet.

Refer to the following section for cabinet slot and station/line capacities. Tables 2-4 and 2-5 show the number of stations and CO lines allowed when additional cabinets and PCBs are used.

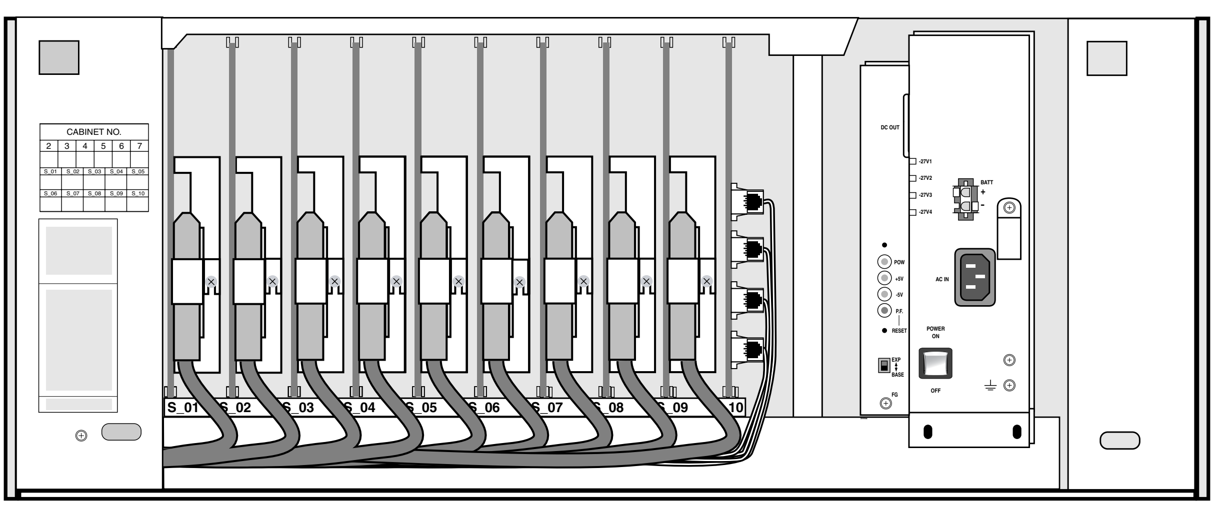


Figure 2-4 Strata CTX670 Expansion Cabinet Interior

CTX670 Remote Expansion Cabinet

A CTX670 Expansion Cabinet can be located up to three kilometers from its Base Cabinet. Remote Expansion Cabinets are enabled by the RRCU PCB. One RRCU connects to up to two ribbon-type Data Cables and applies the inter-cabinet signal to a multi-mode fiber-optic pair. One fiber pair can support one or two expansion cabinets in one remote location using one RRCU in the Base Cabinet and another in the Remote Expansion Cabinet.

The CTX670 Base Cabinet supports up to six Remote Expansion Cabinets (at least one RRCU PCB is required for each remote location).

Remote cabinets support the BIOU for external Page Zones, Night Bell, etc., and all CO line and trunk interface PCBs. Network clock synchronization can only be derived from digital trunks installed in the Base Cabinet (Master) location.

System Capacities

This section contains Strata CTX100 and CTX670 capacities for stations and peripherals, CO lines, station buttons and system features. All tables apply to both systems unless otherwise noted.

Important! *The maximum capacities listed for the CTX100 in Tables 2-3~2-7 are based on an expanded CTX100 (Base + Expansion cabinet).*

Table 2-3 Cabinet and Slot Capacities

Cabinets/Slots/Ports	CTX100	CTX670 Basic Processor BCTU	CTX670 Expanded Processor BCTU + BEXU
Cabinets	1 or 2	1 to 2	1 to 7
Universal slots	4 or 8	8 or 18	8 to 68
Maximum capacity of ports (lines + stations)	112	192	672

Table 2-4 Station/Peripherals System Capacities

Stations	CTX100 Base & Expansion	CTX670 Basic Processor BCTU	CTX670 Expanded Processor BCTU + BEXU
Add-on modules (DADM3120, DADM3020) per Base Cabinet[1]	30 DKTs with 1 ADM 23 DKTs with 2 ADMs	55 DKTs with 1 ADM 43 DKTs with 2 ADMs	55 DKTs with 1 ADM 43 DKTs with 2 ADMs
Add-on modules (DADM3020) per Expansion Cabinet[1]	31 DKTs with 1 ADM 24 DKTs with 2 ADMs	57 DKTs with 1 ADM 45 DKTs with 2 ADMs	57 DKTs with 1 ADM 45 DKTs with 2 ADMs
CTX Attendant consoles	2	2	4
DKT3000- and 2000-series DKTs[1]	72/system (40 Base Cabinet) (40/Expan. Cab.)	152/system (72 Base Cabinet) (80/Expan. Cab.)	552/system (72 Base Cabinet) (80/Expan. Cab.)
IPT telephones	64 per cabinet 72 per system	128 Base 160 Expansion 160 System	128 Base 160 Expansion 560 System
IPT telephones with DADM3120[2]	26 per cabinet 26 per system	58 per cabinet 58 per system	200 per cabinet 200 per system
Cordless Telephones (DKT2004-CT, DKT2104-CT, DKT2204-CT, DKT2304-CT)[1]	72	152	552
Door locks	4	5	10
Door phone control boxes (DDCB)	2	3	8

Table 2-4 Station/Peripherals System Capacities *(continued)*

Stations	CTX100 Base & Expansion	CTX670 Basic Processor BCTU	CTX670 Expanded Processor BCTU + BEXU
Door phones	6	9	24
DSS consoles (DDSS)	3	5	16
ISDN BRI station circuits TE-1 and TA (2B+D per circuit)	12	28	96
Off-premise stations	64	144	544
BPCI used for TAPI only: per cabinet[1]	35	66	66
Total Stations (Digital/Analog/ISDN BRI B channel combined)	72	160	560
Standard stations	64	144	544
Calls existing at the same time	56	96	366

1. Limit is based on cabinet Power Factor (PF).
2. Based on the maximum allowed flexible buttons.

Table 2-5 Line Capacities and Universal PCB Slots

Lines	CTX100 Base & Expansion	CTX670 Basic Processor BCTU	CTX670 Expanded Processor BCTU + BEXU
CO lines – loop start (analog - 8 lines/slot)	64	96	264
CO lines – ground start (analog - 4 lines/slot)	32	72	264
DID lines (analog - 4 lines/slot)	32	72	264
Tie lines (analog - 4 lines/slot)	32	72	264
VoIP lines (4 lines/slot)[1]	8	20	20
T1 lines (DS-1)[2]	64	96	264
ISDN BRI B channel lines[3]	64	96	256
ISDN PRI B channel lines[4]	48	96	264
Strata Net over IP Channels[5]	48	96	264
Total lines (Analog, T1, ISDN BRI and PRI B channels combined)	64	96	264
Channel Groups	32	48	128
Number of groups w/ GCO Line buttons	32	50	128

1. Capacity is limited by FCC, Part 15, ElectroMagnetic Compatibility (EMC) restrictions.
2. T1 lines can be loop start, ground start, Tie or DID (maximum 24 lines per unit, any type or combination).
3. BRI lines provide CO line services, including Caller ID, DID and Direct Inward Lines (DIL).
4. PRI lines provide CO line services, including QSIG Networking, Calling Party Number/Name, DID, Tie, POTS, FX and DIT.
5. Strata Net over IP channels provides Strata Net functionality.

Table 2-6 Station Buttons

Station Buttons per System	CTX100 Base & Expansion	CTX670 Basic Processor BCTU	CTX670 Expanded Processor BCTU + BEXU
Call Forward, Personal CF Buttons	72	160	560
CO Line Buttons	64	96	264
Group CO Line Buttons	64	96	264
Pooled CO Line Buttons	32	50	128
CO Group and Pooled Line Buttons	64	96	264
Station Loop Buttons	8	15	50
Door Unlock Buttons	4	8	16
Flexible Telephone Buttons	1600	3500	12000
Line Buttons in use at the same time	1440	3200	3200
Message Waiting Registration (DNs with MW)	130	230	800
Multiple Appearances of DNs on Telephones	2000	4000	12000
Night Transfer Buttons	32	64	128
One Touch Buttons	800	1750	6000
Primary Directory Numbers [PDNs] per system	72	160	560
Phantom Directory Numbers [PhDNs] per system	288	640	2240
[PhDNs] with Message Waiting Indication LED	18	38	128
ISDN DNs	96 (8 DNs/station)	224 (8 DNs/station)	768 (8 DNs/station)

Table 2-7 System Feature Capacities

Features	CTX100 Base & Expansion	CTX670 Basic Processor BCTU	CTX670 Expanded Processor BCTU + BEXU
Pilot DNs	100	200	256
Advisory LCD Messages (Set on a Telephone)	1	1	1
Advisory LCD Messages Lists (per System)	10	10	10
Attendant Groups	1	1	1
Call Accounting SMDR Interface[1]	1	1	1
Call Forward, System CF Patterns	4	10	32
Call Park Orbits (General)	14	32	64
Call Park Orbits (Individual)	56	96	336
Caller ID/ANI/CNIS Numbers stored (Call History records)	Up to 100/station Up to 660/system	Up to 100/station Up to 1000/system	Up to 100/station Up to 2000/system
CO Line Groups - Incoming Line Groups (ILG)	32	50	128
CO Line Groups - Outgoing Line Groups (OLG)	32	50	128
Outgoing Line Groups (OLG) Members per system (Trunks + ISDN Line Service Index)	96	144	392
Conference Circuits	64	64	96
Conferencing (three-parties simultaneously)[2]	20	21	21
Conferencing (eight-parties simultaneously)[2]	8	8	12
Conference Party types (up to 8 total lines + stations)	6 lines max. 8 stations max.	6 lines max. 8 stations max.	6 lines max. 8 stations max.
Two-CO Line Conferencing – simultaneously[2] (Two party only, no telephone or VM port)	32	48	132
Conference/Line Volume Adjustment (PAD) Groups	6	10	32
DID Numbers for Calling Number ID/system	225	500	1000
DNIS/DID Network Routing Numbers	200	400	1000
DNIS/DID Numbers	450	1000	2000
DTMF Receivers[3]	16	16	32
E911 Groups	8	8	8
Emergency Call Groups	8	8	8
Hunt Groups (Serial/Circular/Distributed combined)	90	200	640
Hunt Group Size (DNs per group)	72	160	560
Hunt Group Stations (per system)	360	800	2800
ISDN DNs	96	224	768
ISDN Line Service Indexes	32	48	128
Multiple Call Ring Group	16	32	64
Night Bell Control Relay[4]	1	1	1
Night Transfer Control Relay[4]	1	1	1
Off-hook Call Announce Handsets (simultaneous)	20	21	31

Table 2-7 System Feature Capacities *(continued)*

Features	CTX100 Base & Expansion	CTX670 Basic Processor BCTU	CTX670 Expanded Processor BCTU + BEXU
Off-hook Call Announce to Telephone Speakers [5]	72	112	352
Page Mute External BGM Control Relay[4]	1	1	1
Page Zone Relays[4]	8	8	8
Page Groups (Phones with or without External Zones)	4	8	16
Paging – (Group Page – simultaneous stations paged)	72	120	120
Pickup Groups	5	10	32
Ring Tones (External Call Ring Tones for DKTs)	4	4	4
Ring Tones (Internal Call Ring Tones for DKTs)	1	1	1
Speed Dial - Station SD numbers per system[6]	1080	2400	5600
Speed Dial - System SD numbers per system	800	800	800
Stratagy DK Voice Mail Systems per system	1	1	1
Tenants	1	1	1
Destination Restriction Level (DRL) Classes	16	16	16
Verified Account Codes	135	300	1000
Voice Mail SMDI Interface[1]	1	1	1

1. SMDI and SMDR require BSIS serial port interface.
2. Conference circuits are used dynamically, so the maximum number of simultaneous conferences is affected by the number of conference members in each conference. The total number of members in simultaneous conferences cannot exceed the total number of conference circuits. Each conference can have up to eight members.
3. DTMF receivers are required for standard touch tone telephones, voice mail integration, Tie, DID and DISA lines.
4. An option BIOU is required for up to four zone page relays and four control relays on the CTX100 and CTX670. One control relay is provided on board the CTX100 processor.
5. Speaker OCA capacity is determined by 2B channel slot availability and power supply. Requires BVSU option in telephone. Speaker OCA is not available on IPT1020-SD telephones.
6. Up to 100 Station SD numbers, allocated in increments of 10, can be programmed per station.

Universal Slot PCBs

Universal Printed Circuit Boards (PCBs) installed in the Strata CTX100 or CTX670 cabinets provide interfaces for stations, lines, and peripherals. Each PCB measures 7.5 x 5.5 inches (190 x 140 mm) and mounts in the slot with a 44-pin backplane connector. PCB external connections to station equipment are made to the Main Distribution Frame (MDF) using industry-standard connectors.

Station, Line and Option PCBs

The PCBs are categorized as station, CO line or option PCBs (see Tables 2-8~2-10). Feature subassemblies that plug onto a universal slot PCB, such as the Standard Telephone Interface Subassembly (RSTS), are listed below the associated PCB.

Table 2-8 Station PCBs

Digital Telephone Interface Unit (ADKU) (CTX100 only)	
Provides eight circuits for 3000 and/or 2000-series digital telephones.	Interface Options: Provides the same interface options as the BDKU (see below), but does not support BDKS. Compatible only with CTX100.
Standard Telephone Interface Unit (ASTU) (CTX100 only)	
Provides two standard telephone circuits. Maximum number of ringers per circuit is three	Interface Options: Standard telephones (no message waiting) Other single-line devices Alternate BGM source Fax machines Voice mail devices
Digital Telephone Interface Unit (BDKU)	
Provides eight circuits for 3000 and/or 2000-series digital telephones (BDKU) + eight more with BDKS (optional).	Interface Options: Digital telephones (with or without BHEU, BPCI, BVSU, DADMs, or digital cordless telephone). Supports BDKS. Stand-alone digital cordless telephone DDSS console BATI DDCB Supports large LCD (DKT3014) features.
Digital Telephone Interface Subassembly (BDKS) Provides eight additional circuits for 3000 and/or 2000-series digital telephones. Attaches to BDKU. One per BDKU. Do not use BDKS for Speaker OCA telephones, except in slot 103 of the CTX100.	Interface Options: Same as BDKU. Not compatible with ADKU or PDKU.
Digital Telephone Interface Unit (PDKU2)	
Provides 8 digital telephone circuits. (2000-series phones only. Do not use the PDKU for 3000-series digital telephones. With 3000-series DKTs, the LCD display is only 16 characters wide and the `Spdial` button will not work.	Interface Options: Digital telephones (with or without BHEU or HHEU, DVSU, DADMs, or digital cordless telephone) Stand-alone digital cordless telephone DDSS console DDCB Does not support DKT3014-SDL features.

Table 2-8 Station PCBs *(continued)*

Digital Telephone Interface Unit (BWDKU1A)	
Provides 8 or 16 digital telephone circuits. Compatible with Strata CTX and Strata DK. Jumper plugs on the PCB determine the number of DKT circuits and CTX or DK compatibility. It does not need a Ferrite Core. It has one protector for every two circuits. The BWDKU1A is similar to BDKU/BDKS, except DKT wiring is all 1 pair.	Interface Options: Digital telephones (with or without BHEU or HHEU, DVSU, DADMs, or digital cordless telephone) Stand-alone digital cordless telephone DDSS console DDCB
Internet Protocol Telephone (IPT) Interface Unit (BIPU-M1A, BIPU-M2A)	
Provides 16 IPT telephone circuits One 100Base-TX RJ45 port Built-in Digital Signal Processor (DSP) (BIPS1A-16) One RS-232 maintenance port Network Address Translation (NAT) compatible for remote IP telephones (BIPU-M2A) Enhanced version of MEGACO+ for Voice over IP MEGACO+ mobility for Mobility Communications System (MCS) Roaming (BIPU-M2A)	Interface Options: LAN, Virtual Private Network (VPN) Internet, VPN WAN, Intranet.
Digital/Standard Telephone Interface Unit (RDSU)	
Without RSTS, provides: Two standard telephone/ Four digital telephone circuits (2000-series phones only). With RSTS, provides: Four standard telephone/ Four digital telephone circuits (2000-series phones only).	**Interface Options:** Digital – same as PDKU. Standard – same as RSTU (standard Message Waiting not available)
Standard Telephone Interface Unit (BSTU, RSTU3)	
Provides eight standard telephone circuits. Stutter dial tone is provided for Message Waiting audible indication.	**Interface Options:** Standard telephones Voice mail ports Off-premises stations Other similar devices Alternate BGM source Auto Attendant digital announcer Message Waiting lamp Fax machines ACD announcer
Standard Telephone Subassembly (RSTS) Attaches to RDSU. Provides two additional standard telephone circuits. One maximum per RDSU.	Interface Options: Same as RSTU, except no Message Waiting lamp.
-48 Volt Supply Internal Option (R48S)	
Attaches to BSTU, RSTU and RDSU 48VDC circuit for up to eight standard telephone circuits.	Interface Options: Optionally interfaces to the RSTU and RDSU to extend loop length of standard telephones from 600 ohms to 1200 ohms. Required for OPS operation.
Stratagy DK	
Provides two, four, six, or eight VM ports. All of the above Stratagy DK systems use eight station ports of Strata CTX capacity.	

Table 2-9 CO Line PCBs

Strata Net Over VoIP Interface Unit (BIPU-Q1A)	
Provides 16 IP QSIG channels One 100Base-TX RJ45 port One RS-232 maintenance port QSIG over IP standard protocol (ECMA-336) Voice coding G.711/G.729A Built-in Digital Signal Processor (DSP) (BIPS1A-16) NAT compatible	**Interface Options:** LAN, Virtual Private Network (VPN) Internet, VPN WAN, Intranet.
Internet Protocol (IP) Interface Unit (BVPU)	
Provides four VoIP Circuits as E&M Tie lines One 10Base-T port One RS-232 maintenance port H.323 standard for Voice over Internet Protocol (VoIP)	**Interface Options:** LAN, Internet, WAN.
Caller ID Interface Unit (RCIU2)	
Provides four Caller ID circuits. With RCIS: eight circuits.	**Interface Options:** Provides Caller ID LCD display for analog loop or ground start lines with Caller ID. Requires: RCOU, RCOS, RGLU2, RGLU3 or PCOU. Not compatible with T1.
Caller ID Interface Subassembly (RCIS) Attaches to the RCIU2.	Same as RCIU2.
Direct Inward Dialing Interface Unit (RDDU)	
Provides four DID circuits.	**Interface Options:** DID analog lines.
Enhanced 911 CAMA Trunk Interface Unit (RMCU/RCMS)	
E911 CAMA circuits. Provides up to four CAMA trunk circuits. The RMCU/RCMS eliminates the need for connection of adjunct terminal adapter equipment to E911 CAMA trunks. Requires one or two RCMS PCBs for two or four CAMA lines respectively.	E911 analog CAMA trunks.
CAMA Trunk Subassembly (RCMS) RCMS attaches to RMCU. Provides two E911 CAMA circuits. Up to two RCMSs per RMCU for four CAMA lines max. (One RCMS comes packaged with the RMCU.)	Same as RMCU.
Ground/Loop Start Interface CO Line Interface Unit (RGLU2, RGLU3)	
Provides four ground or loop start line circuits. Each can be individually set for ground or loop start operation.	**Interface Options:** Analog loop or ground start analog lines.
ISDN S/T-type Basic Rate Interface Unit (RBSU)	
Two ISDN BRI S/T point circuits (NT or TE). Each circuit is 2B+1D. (Host for the RBSS.)	**Interface Options:** Network and/or station side.
Basic Rate Interface Subassembly (RBSS) Attaches to RBSU. One RBSS subassembly per RBSU. Two ISDN BRI, S point circuits (2B+D each).	**Interface Options:** Station side only.

Table 2-9 CO Line PCBs *(continued)*

ISDN U-type Basic Rate Interface Unit (RBUU)	
Provides two ISDN BRI, U point circuits (2B+D each). Host for the RBUS.	**Interface Options:** Network and/or station side. Network side requires a dealer-supplied NT1 interface.
Basic Rate Interface Subassembly (RBUS) Attaches to RBUU. One RBUS subassembly per RBUU. Two ISDN BRI, U point circuits (2B+D each) subassembly for the RBUU.	**Interface Options:** Network and/or station side.
ISDN Primary Rate Interface Unit (BPTU1 or RPTU2)	
Provides (1~8B + D), (1~16B + D), or (1~23B + D) channels (lines), depends on system programming. BPTU or RPTU2 is required for QSIG Networking.	**Interface Options:** ISDN PRI POTS FX Tie (senderized) Tie (cut through) OUTWATS (intra-LATA) OUTWATS (inter-LATA) InWATS QSIG
Loop Start CO Line Interface Unit (RCOU)	
Provides four CO analog loop start line circuits. With RCOS, provides eight CO analog loop start line circuits.	**Interface Options:** CO analog loop start lines
Loop Start CO Line Interface Subassembly (RCOS) Provides four additional Loop Start CO lines. One RCOS subassembly per RCOU.	Same as RCOU.
T1/DS-1 Interface Unit (RDTU2)	
Provides T1 (DS1) Interface: 1~8, 1~16, or 1~24 channels (lines), depends on system programming.	**Interface Options:** T1 Loop start lines Ground start lines Tie lines (wink or immediate) DID/DOD lines (wink or immediate)
Remote Expansion Cabinet Unit (RRCU)	
Supports two CTX670 remote cabinets. 62.5 mμ, multi-mode fiber.	Remote cabinet not supported by main system reserve power.
Tie Line Unit (REMU2)	
Provides four analog Tie line circuits.	**Interface Options:** E&M Tie lines Two- or four-wire transmission Type I signaling Type II signaling Immediate start Wink start

Table 2-10 Option PCBs

Option Interface Unit (BIOU)	**Interface Options:** Provides Paging output (600 ohm and three-watt amp), four zone paging relays, three MOH interfaces and four control relays (Night Transfer and BGM mute).

Functional Block Diagrams

The Functional Block Diagrams show the PCBs and interface connectors used for connecting the station.

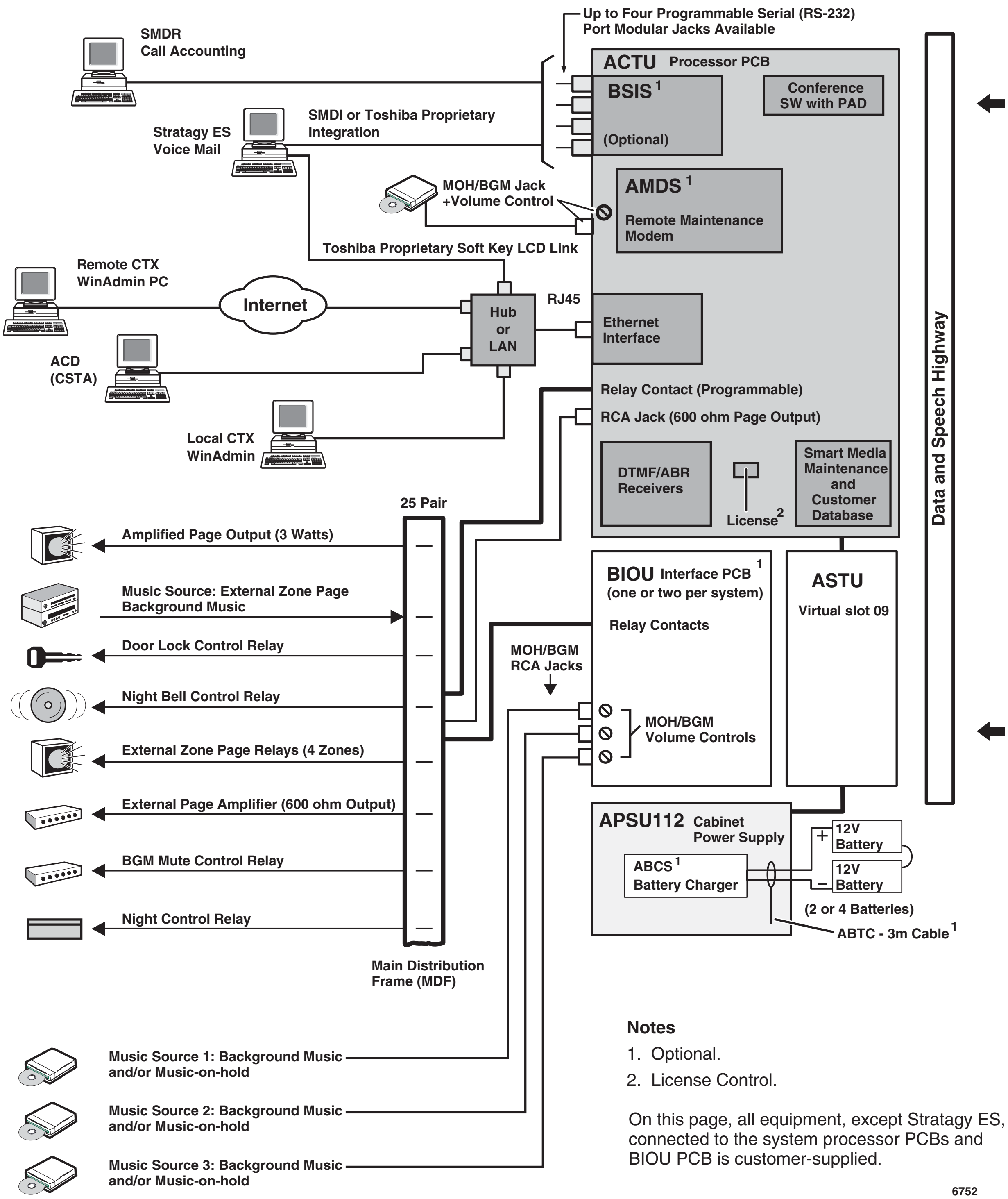
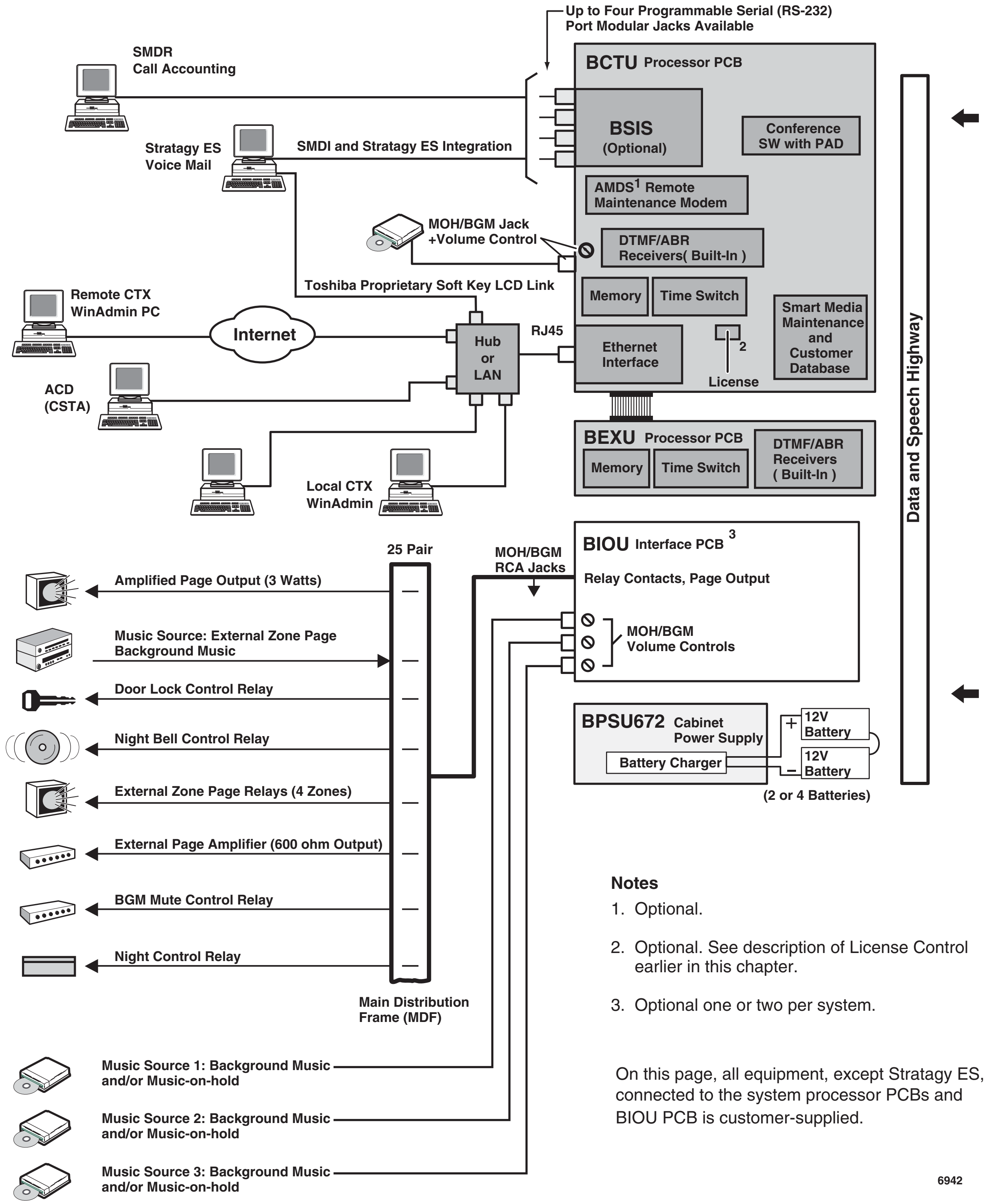


Figure 2-5 CTX100 System Processor and Option Interface PCBs



Notes

1. Optional.
2. Optional. See description of License Control earlier in this chapter.
3. Optional one or two per system.

On this page, all equipment, except Stratagy ES, connected to the system processor PCBs and BIOU PCB is customer-supplied.

Figure 2-6 CTX670 System Processor and Optional Interface PCBs

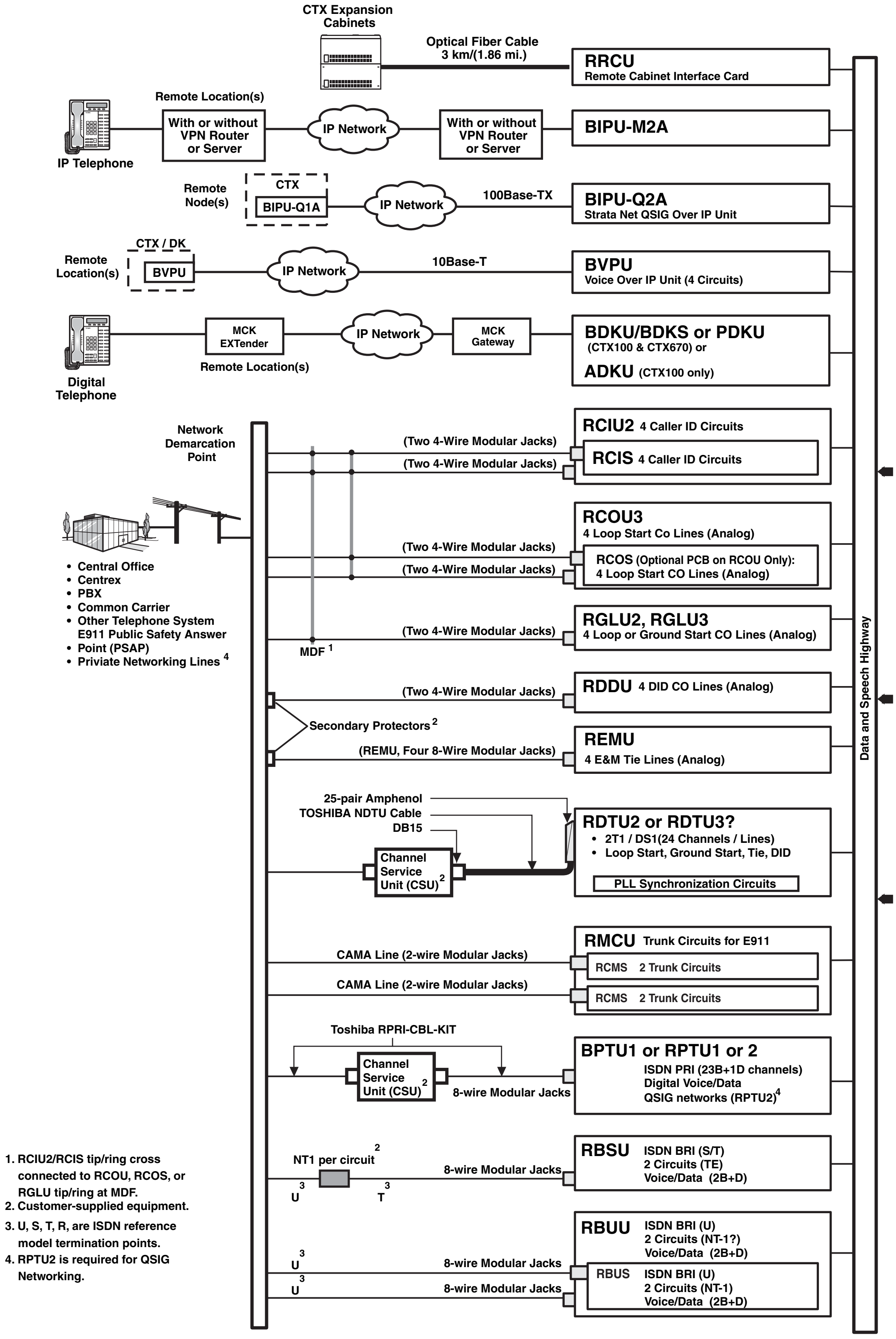
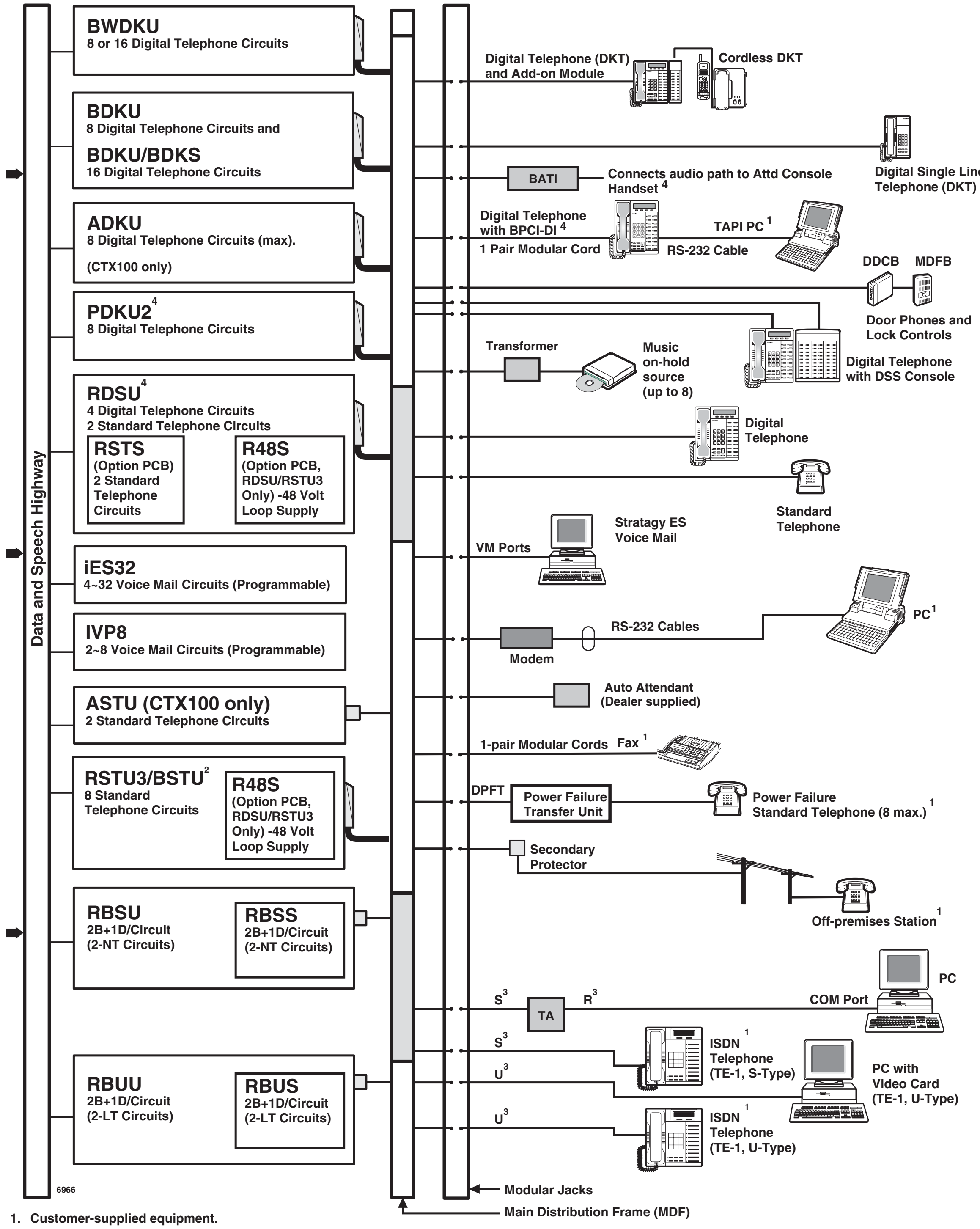


Figure 2-7 CTX100 and CTX670 CO Line Side Functional Block Diagram



1. Customer-supplied equipment.
2. RSTU2 or above is required for standard telephone message waiting lamp.
3. U, S, T, R are ISDN reference model termination points.
4. PDKU and RDSU should only be used for 2000-series digital telephones. They do not support all of the 3000-series digital telephone features, including LCD. The PDKU also does not support BPCI, BATI and the CTX Attendant Console.

Figure 2-8 CTX100 and CTX670 Station Side Functional Block Diagram

Worksheet Description

These configuration worksheets cover Strata CTX telephones, PCBs and cabinets; they do not cover other peripheral equipment requirements.

Knowledge of all customer telephone requirements is needed to complete the worksheets. These include all telephone sets, CO line types and Strata CTX system feature options for the main location (with the Strata CTX Base Cabinet) and each remote location. A set of worksheets for the main system location and a separate set of worksheets for each remote location must be completed.

CTX670 Remote Cabinet Configuration Considerations

Several items must be considered when configuring a CTX670 system with Remote Cabinets. (CTX100 systems do not support remote cabinet configurations).

1. Each location must be configured independently. Separate worksheets are needed for each location to break down the line, trunk and service circuits by locations. Use the rules provided in this chapter to determine the required quantities of PCBs.
2. Estimate the number of cabinets according to normal configuration worksheets.
3. Account for RRCU PCBs at each remote location (see Table 2-52 on page 2-38 in Worksheet 6). An RRCU PCB can support up to two Expansion Cabinets at one remote location. For example, 18 PCBs at one remote location would require two Expansion Cabinets and one RRCU card for the remote location.
4. If necessary, adjust the number of cabinets required. The maximum number of Expansion Cabinets per system is six. The maximum number of remote locations is also six. The maximum number of cabinets supported by one fiber connection is two.
5. Determine the total number of RRCU PCBs required at all remote locations (see Table 2-52 on page 2-38 in Worksheet 6). Add the same number of RRCU cards to the configuration of the Base Cabinet.
6. Validate the configuration. A valid configuration answers “yes” to the following questions.
    - Do all cabinets (local and remote) comply with power limitations? The RRCU has a power factor of 4.0. See Table 2-58 on page 2-43 in Worksheet 7.
    - Are there six or fewer remote locations?
    - Are there six or fewer RRCU cards in the Base Cabinet?
7. Order one cabinet cover (BCTC) and cable mesh shield (B50MT) for each remote location.
8. Digital Trunks – A Remote Cabinet can support all PCBs that can be installed in a local Expansion Cabinet, including digital trunk cards. However, the system cannot derive network clock synchronization from a digital trunk installed in a remote cabinet. This requires a digital trunk installed in the Base Cabinet or in a local Expansion Cabinet connected to the Base by a standard ribbon cable. For each Remote Cabinet location, local trunks may be required for correct 911 service.

Component Worksheets

Fill in Worksheets 1~8 for each location to determine system cabinet and PCB requirements for:

Customer Name ______________________ Location Description______________________

Main Location ________________ Remote Location 1___ 2___ 3___ 4___ 5___ 6___

Worksheet 1: Toshiba DKT and IP Telephones

Main Location _______________ Remote Location 1___ 2____ 3____ 4____ 5____ 6____

Item#	Digital Telephone Equipment Required for Cabinet Number __________	Qty
DT01	DKT3010-S - 10 button Digital Speakerphone (gray)	
DT02	DKT3010-S (W) - 10 button Digital Speakerphone (white)	
DT03	DKT3010-SD - 10 button Digital Speakerphone with LCD (gray)	
DT04	DKT3010-SD (W) - 10 button Digital Speakerphone with LCD (white)	
DT05	DKT3020-S - 20 button Digital Speakerphone (gray)	
DT06	DKT3020-S (W) - 20 button Digital Speakerphone (white)	
DT07	DKT3020-SD - 20 button Digital Speakerphone with LCD (gray)	
DT08	DKT3020-SD (W) - 20 button Digital Speakerphone with LCD (white)	
DT09	DKT3014-SDL - 14 button Digital with large LCD (gray)	
DT10	DKT3014-SDL - 14 button Digital with large LCD (white)	
DT11	DDSS3060 - 60 button Digital Direct station Select Console (gray)	
DT12	DDSS3060 - 60 (W) button Digital Direct station Select Console (white)	
DT13	IPT1020-SD - 20 button IP Telephone (gray)	
DT14	DKT2010-S -10 button Digital Speakerphone (gray)	
DT15	DKT2010-S (W) -10 button Digital Speakerphone (white)	
DT16	DKT2010-SD -10 button Digital Speakerphone with LCD (gray)	
DT17	DKT2010-SD (W) -10 button Digital Speakerphone with LCD (white)	
DT18	DKT2020-S -20 button Digital Speakerphone (gray)	
DT19	DKT2020-S (W) -20 button Digital Speakerphone (white)	
DT20	DKT2020-SD -20 button Digital Speakerphone with LCD (gray)	
DT21	DKT2020-SD (W) -20 button Digital Speakerphone with LCD (white)	
DT22	DKT2020-FDSP -20 button Digital Full-Duplex Speakerphone with LCD (gray)	
DT23	DDSS2060- 60 button Digital Direct Station Select Console (gray)	
DT24	DDSS2060 (W) -60 button Digital Direct Station Select Console (white)	
DT25	DDCB - Digital Door Phone Control Box (supports 3 MDFB Door phones)	
DT26	Pre-wired Digital Telephone Ports (allocates spare, hot wired digital ports)	
DT27	DKT2204-CT - Digital Cordless Phone (digital spread spectrum - sharing port with DKT)[1]	
DT28	DKT2204-CT - Digital Cordless Phone (digital spread spectrum - stand alone)	
DT29	DKT2304-CT - Digital Cordless Phone (digital narrow band sharing port with DKT)[1]	
DT30	DKT2304-CT - Digital Cordless Phone (digital narrow band - stand alone)	
DT31	Total Digital ports required (Add DT01 Qty. ~ DT29 Qty.)	
DT32	Total BDKU, BWDKU or BDKU/BDKS or ADKU PCBs/Slots required (DT30, Qty./8 or DT30 Qty./16)[2]	
DT33	Total RDSU PCBs/Slots required to add 4 DKT/2 SLT Devices	
DT34	Total RDSU/RSTS PCBs/Slots required to add 4 DKT/4 SLT Equipment	
Item	**IP Telephone**	**Qty**
IPT01	IPT1020-SD	
IPT02	Total BIPU-M2A PCBs/slots required (IPT01 quantity/16)	

1. Do not count shared ports into the Total (DT20) BWDKU or BDKU/BDKS ports required.
2. Round up these totals to the nearest whole number.

Important! *The maximum number of DKTs per cabinet is 80. This is a power factor limitation (see Worksheet 7)*

Miscellaneous Digital Telephone Equipment (See Table 2-52)		
DT34	RFDM - External Microphone for DKT2020-FDSP Full Duplex Digital Speakerphone	
DT35	MDFB - Door Phone connected to Digital Door Phone Control Box (requires 1DDCB output)	
DT36	Door Lock connected to Digital Door Phone Control Box (requires 1DDCB output)	
DT37	BVSU - Interface for Digital Telephones that require Speaker OCA (DKT3000 and DKT2000)	
DT38	BPCI - PC/TAPI Interface for digital telephone (gray) (DKT3000)	
DT39	Secondary Protectors for any Digital station devices located off-premise.	
DT40	BHEU - Telephone Headset Interface (DKT2000 and DKT3000)	
DT41	DADM3020 - 20-button Add-on module (gray)	
DT42	DADM3020(w) - 20-button Add-on module (white)	
DT43	DADM2020 -20 button Digital Add-on Module (gray)	
DT44	DADM2020 (W) -20 button Digital Add-on Module (white)	
DT45	DADM3120 - 20 button IP or DKT Add-on module (gray)	

Worksheet 2: Standard Telephone, Stratagy DK, IVP8

Main Location _______________ Remote Location 1___ 2___ 3___ 4____5___ 6____

Item#	Dealer Supplied Standard Telephone (SLT) Equipment Required	Qty
ST1	Standard Tone-Dial Telephone	
ST3	External Modem and/or Fax Devices	
ST4	External Voice Mail Ports to support Stratagy or other VM (not for Stratagy DK)	
ST5	Other Devices, not listed, requiring standard telephone circuit interface	
ST6	Alternate BGM Source connected to Std.Tel. port (allocates ASTU, BSTU, RSTU ports)	
ST7	Pre-wired Standard Telephone ports (to allocate spare, hot wired, standard tel. ports)	
ST8	Total ASTU, BSTU, RSTU PCBs/Slots required (ST1~ST9, QTY/8)*	
ST9	Total RDSU PCBs/Slots required to add 4 DKT/2 SLT Devices	
ST10	Total RDSU/RSTS PCBs/Slots required to add 4 DKT/4 SLT Equipment	
Miscellaneous Standard Telephone (SLT) Equipment Required		
ST11	R48S PCB for up to 8 Standard Telephone Off Premise Station (OPS) circuits	
ST12	Secondary Protector for Standard telephone equipment located off premise	
ST13	DPFT, Power Failure Transfer Unit for up to 8 standard telephone/loop start lines	
Stratagy DK or IVP8 Equipment Required		
ST14	Each Stratagy Voice Mail PCB provides up to 8 Voice Mail ports and uses 8 ports of system capacity. No other PCBs are required to interface with Stratagy DK or IVP8. (One allowed per CTX system.)	

Worksheet 3: CO Line

Main Location _______________ Remote Location 1___ 2___ 3___ 4____5___ 6____

Item #	CO Line Type Required	Line Qty	/X=	PCB Qty	PCB Name	Slots Required[1]	
CO1	Analog Loop Start CO Lines with RCOU		/4=		RCOU	1 Slot/RCOU =	
CO2	Analog Loop Start CO Lines with RCOU/RCOS		/8=		RCOU/RCOS	1 Slot/RCOU/RCOS =	
CO3	Analog Ground Start CO Lines with RGLU		/4=		RGLU	1 Slot/RGLU =	
CO4	Caller ID Line interface with RCIU		/4=		RCIU	1 Slot/RCIU =	
CO5	Caller ID Line interface with RCIU/RCIS		/8=		RCIU/RCIS	1 Slot/RCIU/IS =	
CO6	BVPU VoIP Circuits[2]		/4=		BVPU	1 Slot/BVPU =	
CO7	Analog Tie Lines with REMU		/4=		REMU	1 Slot/REMU =	
CO8	Analog DID Lines with RDDU		/4=		RDDU	1 Slot/RDDU =	
CO9	T1 Digital Lines with RDTU2		/24=		RDTU2	2 Slots/RDTU2 =	
CO10	T1 Digital Lines with RDTU2		/16=		RDTU2	1 Slot/RDTU2 =	
CO11	T1 Digital Lines with RDTU2		/8=		RDTU2	1 Slots/RDTU2 =	
CO12	IP with BIPU-Q1A		/8=		BIPU-Q1A	1 Slot/BIPU-Q1A =	
CO13	IP with BIPU-Q1A		/16=		BIPU-Q1A	1 Slot/BIPU-Q1A =	
CO14	ISDN and/or QSIG with RPTU or BPTU		/23		RPTU2	1 Slot/RPTU2 =	
CO15	ISDN and/or QSIG with RPTU or BPTU		/16		RPTU2	1 Slot/RPTU2 =	
CO16	ISDN and/or QSIG with RPTU or BPTU		/8		RPTU2	1 Slot/RPTU2 =	
CO17	ISDN BRI Circuit[3], U-type with RBUU		/2=		RBUU	1 Slot/RBUU =	
CO18	ISDN BRI Circuits[1], U-type with RBUU/RBUS		/4=		RBUU/RBUS	1 Slot/RBUU/US =	
CO19	ISDN BRI Circuits[1], S/T-type with RBSU		/2=		RBSU	1 Slot/RBSU =	
CO20	ISDN BRI Circuits[1], S/T-type with RBSU/RBSS		/4=		RBSU/RBSS	1 Slot/RBSU/RBSS =	
CO21	E911 CAMA Circuits (RMCS/RCMS=2 circuits, add another RCMS for 4 circuits		/4=		RMCU/RCMS	1 Slot/RMCU/RMMS=	
CO22		**Total Slots required for line PCBs**					
Miscellaneous CO Line Equipment							
CO23	Dealer-supplied NT-1 S/T BRI Line Circuits	Number of NT-1s				No slots required.	
CO24	Dealer-supplied CSU for BPTU or RPTU and/or RDTU2	Number of CSUs				No slots required.	
CO25	Cable kits for BPTU or RPTU2	Number of RPRI-CBL-KIT				No slots required.	
CO26	Cable Kits for BPTU or RPTU2	Number of RPRI-CBL-KIT				No slots required.	
CO27	Secondary Protectors For RDDU and REMU	Number of Protectors.				No slots required.	

1. Round up fractions to the nearest whole number.
2. Maximum of five PCBs with CTX670 and two BVPU PCBs with CTX100 because of FCC Part 15 emissions requirement.
3. Each ISDN BRI circuit can be configured to provide two CO lines or interface to one BRI station. Each circuit uses 2 CO lines and 2 station ports of system capacity regardless of how it is configured (line or station).

Worksheet 4: Page/MOH/Control Relay

Up to two BIOU interfaces can be installed to provide the following interfaces:

Main Location _______________ Remote Location 1___ 2___ 3___ 4___ 5___ 6___

Feature	1 BIOU	2 BIOUs	Enter No. of Required BIOUs
Page Zone Relays	4	8	
Control Relays[1]	4	8	
MOH/BGM Device Interface[2]	3	6	
Page Outputs[3]	1	2	

1. The CTX100 processor provides one built-in control relay.
2. CTX100 and CTX670 processors each provide one built-in MOH/BGM interface (RCA jack).
3. CTX100 processor provides one built-in 600 ohm page output. Each BIOU provides a 600 ohm and 3-watt page output on the CTX670 only.
4. Control relays provide closures for a door lock, page mute, night service and night bell contact.

Worksheet 5: Strata CTX100 Cabinet Slots

Write in the PCBs installed in each cabinet slot in the Cabinet Diagram below. Use the PCB placement guideline below to place PCBs in the correct slots. A number of tables provide CTX100 capacities and configuration examples in this section.

CTX Base Cabinet Slots					CTX Expansion Cabinet Slots			
ACTU	**S101**	**S102**	**S103**	**S104**	**S105**	**S106**	**S107**	**S108**
(AETS___) (AMDS__) (ARCS__) (BSIS__)								
S109								
(ASTU__)								

For cost-effective configurations, try to fit all PCBs into the CTX100 Base Cabinet. This allows up to 16 loop start COs by 32 DKTs, and up to 24 T1 or PRI COs by 40 DKTs.

- If loop start CO and DKT combinations are required, use CTX100-ECONOPKG (RCOU, ADKU with common equipment) for up to four CO by eight DKTs or CTX100-ECONOTWO (two RCOU, two ADKU with common equipment) for eight CO lines by 16 DKTs or greater. Otherwise, use CTX100-0X8PKG.
- If more than 16 channels are required on an RDTU, BPTU, RPTU, place PCB in S103. Slot 104 is available for another PCB.
- BIPU-M2A, BIPU-M1A or BIPU-Q1A can be installed in any slot to provide 16 channels.
- If 9~16 DKTs require Speaker OCA, place BDKU/BDKS PCBs in S103 if it is available.
- Place other required PCBs according to the guidelines herein.
- Consult the following tables of maximum system capacity slot configurations as guidelines for PCB slot placement.
- Check system capacities in Tables 2-3~2-7 to confirm that the features to be used are within limitations.

Notes

1. Always check the cabinet power factors using Worksheet 7 to make sure the installed PCBs and telephones do not exceed the power factor limitations.
2. ACTU processor optional subassembly functions (see "CTX100 Processor Optional Subassemblies" on page 2-3). Any PCB plus its PCB subassembly can be installed in any slot with the exception of RDTU, BPTU, RPTU PCBs that support more than 16 channels, and BDKU/BDKS PCBs that support Speaker OCA.
3. RDTU, BPTU, RPTU PCBs can be placed in any odd numbered slot using the following rules:
    - If RDTU, BPTU or RPTU is placed in Slot 103 (preferred) with 8, 16 or 24 channels, another PCB can still be installed in S104.
    - If RDTU, BPTU or RPTU is placed in Slots 101, 105, or 107 with 8 or 16 channels, another PCB can still be installed in the next slot; however, if 17~24 channels are required the next even slot must be vacant.
    - RDTU and/or BPTU or RPTU can be placed in any odd slot. If more than 16 channels are required, the next slot must be vacant, except if the PCB is placed in slot 103, which provides up to 32 time slots for RDTU, BPTU, or RPTU. Max. BPTU or RDTU channels = 64; max. RPTU channels = 48.
    - If only 16 B channels of PRI are needed, another card can be installed in the next slot. The position of D-channels can still be set to the 24th channel because the data of the D-channel is passed through the data highway, not the PCM highway. The position of the D-channel doesn't affect the installation of cards in the CTX.
4. Digital telephone PCBs that support Speaker OCA can be placed in slots using the following rules:
    - If ADKU, BDKU (without BDKS) or PDKU must support Speaker OCA, it can be installed in any slot; another PCB can be installed in the next even slot.
    - If a BWDKU or BDKU/BDKS PCB must support Speaker OCA it can only be installed in Slot 103; another PCB can be installed in S104.

CTX100 Max. Capacity Configuration Examples

The tables in this section summarize the maximum capacities of digital telephones with various types of line circuits. A PCB placement diagram for each numbered configuration follows tables.

Digital Telephones and Loop Start Lines With or Without Caller ID

Table 2-11 CTX100 Base Cabinet with Analog, Loop Start Lines

4 Universal Slots 40 Stations (Max.) 24 CO lines (Max.) 44 Stations + Analog loop start lines combined (Max.)		
Table No.	**Stations**	**Analog loop start lines**
2-12	40	4 (none can have Caller ID)
2-13	32	8 (all can have Caller ID)
2-14	32	16 (none can have Caller ID)
2-15	16	16 (8 can have Caller ID)
2-16	24[1]	8 (none can have Caller ID)

1. Using ADKU.

Table 2-12 CTX100 Base: 40 stations, 4 loop start lines, 0 CLID

S101	S102	S103[1]	S104
BDKU/ BDKS	BDKU/ BDKS	ADKU	RCOU
16 DKTs	16 DKTs	8 DKTs	4 lines

1. S103 is only 8 DKTs and S104 is only 4 lines because of cabinet power factor

Table 2-13 CTX100 Base: 32 stations, 8 loop start lines, 8 CLID

S101	S102	S103	S104
BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCIU/RCIS
16 DKTs	16 DKTs	8 lines	8 CLID

Table 2-14 CTX100 Base: 32 stations, 16 loop start lines, 0 CLID

S101	S102	S103	S104
BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS
16 DKTs	16 DKTs	8 lines	8 lines

Table 2-15 CTX100 Base: 16 stations, 16 loop start lines, 8 CLID

S101	S102	S103	S104
BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS	RCIU/RCIS
16 DKTs	8 lines	8 lines	8 CLID

Table 2-16 CTX100 Base: 24 stations with ADKU, 8 loop start lines, 0 CLID

S101	S102	S103	S104
ADKU	ADKU	ADKU	RCOU/ RCOS
8 DKTs	8 DKTs	8 DKTs	8 lines

Analog Loop Start Lines with or without Caller ID

Table 2-17 CTX100 Base and Expansion Cabinet with Analog Loop Start Lines

8 Universal Slots 72 Stations (Max.) 56 CO lines (Max.) 92 Stations + Analog Loop Start Lines combined (Max.)		
Table No.	**Stations**	**Analog loop start lines**
2-18	72	20 (none can have Caller ID)
2-19	72	16 (8 can have Caller ID)
2-20	64	32 (none can have Caller ID)
2-21	64	24 (8 can have Caller ID)
2-22	64	16 (all can have Caller ID)
2-23	48	40 (none can have Caller ID)
2-24	48	32 (8 can have Caller ID)
2-25	48	24 (16 can have Caller ID)
2-26	32	48 (none can have Caller ID)
2-27	32	40 (8 can have Caller ID)
2-28	32	32(16 can have Caller ID)
2-29	32	24 (24 can have Caller ID)
2-30	16	32 (24 can have Caller ID)

Table 2-18 CTX100 Base & Expansion: 72 stations, 20 loop start lines, 0 CLID

S101	S102	S103[1]	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCOU	ADKU	BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS
16 DKTs	16 DKTs	4 lines	8 DKTs	16 DKTs	16 DKTs	8 lines	8 lines

1. S103 is only 4 lines and S104 is only 8 DKTs because of cabinet power factor.

Table 2-19 CTX100 Base & Expansion: 72 stations, 16 loop start lines, 8 CLID

S101	S102	S103	S104[1]	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCIU/RCIS	ADKU	BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS
16 DKTs	16 DKTs	8 CLID	8 DKTs	16 DKTs	16 DKTs	8 lines	8 lines

1. S104, only 8 DKTs because of cabinet power factor.

Table 2-20 CTX100 Base & Expansion: 64 stations, 32 loop start lines, 0 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS	BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS
16 DKTs	16 DKTs	8 lines	8 lines	16 DKTs	16 DKTs	8 lines	8 lines

Table 2-21 CTX100 Base & Expansion: 64 stations, 24 loop start lines, 8 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCIU/RCIS	RCOU/ RCOS	BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS
16 DKTs	16 DKTs	8 CLID	8 lines	16 DKTs	16 DKTs	8 lines	8 lines

Table 2-22 CTX100 Base & Expansion: 64 stations, 16 loop start lines, 16 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCIU/RCIS	RCOU/ RCOS	BDKU/ BDKS	BDKU/ BDKS	RCIU/RCIS	RCOU/ RCOS
16 DKTs	16 DKTs	8 CLID	8 lines	16 DKTs	16 DKTs	8 CLID	8 lines

Table 2-23 CTX100 Base & Expansion: 48 stations, 40 loop start lines, 0 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS	RCOU/ RCOS
16 DKTs	16 DKTs	8 lines	8 lines	16 DKTs	8 lines	8 lines	8 lines

Table 2-24 CTX100 Base & Expansion: 48 stations, 32 loop start lines, 8 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS	BDKU/ BDKS	RCOU/ RCOS	RCIU/RCIS	RCOU/ RCOS
16 DKTs	16 DKTs	8 lines	8 lines	16 DKTs	8 lines	8 CLID	8 lines

Table 2-25 CTX100 Base & Expansion: 48 stations, 24 loop start lines, 16 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCIU/RCIS	RCOU/ RCOS	BDKU/ BDKS	RCOU/ RCOS	RCIU/RCIS	RCOU/ RCOS
16 DKTs	16 DKTs	8 CLID	8 lines	16 DKTs	8 lines	8 CLID	8 lines

Table 2-26 CTX100 Base & Expansion: 32 stations, 48 loop start lines, 0 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS	RCOU/ RCOS	RCOU/ RCOS	RCOU/ RCOS	RCOU/ RCOS
16 DKTs	16 DKTs	8 lines	8 lines	8 lines	8 lines	8 lines	8 lines

Table 2-27 CTX100 Base & Expansion: 32 stations, 40 loop start lines, 8 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS	RCOU/ RCOS	RCOU/ RCOS	RCIU/RCIS	RCOU/ RCOS
16 DKTs	16 DKTs	8 lines	8 lines	8 lines	8 lines	8 CLID	8 lines

Table 2-28 CTX100 Base & Expansion: 32 stations, 32 loop start lines, 16 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCOU/ RCOS	RCOU/ RCOS	RCIU/RCIS	RCOU/ RCOS	RCIU/RCIS	RCOU/ RCOS
16 DKTs	16 DKTs	8 lines	8 lines	8 CLID	8 lines	8 CLID	8 lines

Table 2-29 CTX100 Base & Expansion: 32 stations, 24 loop start lines, 24 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RCIU/RCIS	RCOU/ RCOS	RCIU/RCIS	RCOU/ RCOS	RCIU/RCIS	RCOU/ RCOS
16 DKTs	16 DKTs	8 CLID	8 lines	8 CLID	8 lines	8 CLID	8 lines

Table 2-30 CTX100 Base & Expansion: 16 stations, 32 loop start lines, 24 CLID

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	RCOU/ RCOS	RCIU/RCIS	RCOU/ RCOS	RCIU/RCIS	RCOU/ RCOS	RCIU/RCIS	RCOU/ RCOS
16 DKTs	8 lines	8 CLID	8 lines	8 CLID	8 lines	8 CLID	8 lines

CTX100 Base Only: Digital Telephones and T1 and/or PRI lines

RPTU2 (PRI) is limited to 48 channels; RDTU2 and BPTU (T1) are limited to 64 channels.

Table 2-31 CTX100 CTX Base Cabinet with T1 and/or PRI lines

4 Universal Slots 40 Stations (Max.) 48 lines (Max.) 64 Stations + T1 and/or PRI or IP-QSIG lines combined (Max.)		
Table No.	**Stations**	**T1 and/or PRI lines**
2-32	40	24/23
2-33	32	40/40
2-34	16	48/46

Table 2-32 CTX100 Base: 40 stations and 24 T1 and/or PRI lines

S101	S102	S103	S104[1]
BDKU/ BDKS	BDKU/ BDKS	RxTU2[2]	ADKU
16 DKTs	16 DKTs	24 lines	8 DKTs

1. S104, only 8 DKTs because of cabinet power factor.
2. RxTU2 could be RDTU2 (T1), RPTU2 or BPTU (PRI).

Table 2-33 CTX100 Base: 32 stations and 40 T1 and/or PRI lines

S101	S102	S103	S104
RxTU2	BDKU/ BDKS	RxTU2[1]	BDKU/ BDKS
16/15 lines	16 DKTS	24/23 lines	16 DKTS

1. RxTU2 could be RDTU2 (T1), RPTU2 or BPTU (PRI).

Table 2-34 CTX100 Base: 16 stations and 48 T1 and/or PRI lines

S101	S102	S103	S104
RxTU2	Vacant (Shared)	RxTU2[1]	BDKU/ BDKS
24/23lines		24/23 lines	16 DKTS

1. RxTU2 could be RDTU2 (T1), RPTU2 or BPTU (PRI).

CTX100 Base & Expansion: Digital Telephones and T1 and/or PRI lines

8 Universal Slots 72 Stations (Max.) 64 lines (Max.) 112 Stations + T1 and/or PRI or IP-QSIG lines combined (Max.)	
Stations	**T1 and/or PRI lines[1]**
72	40/40
64	48/48
56	56/48
48	64/48

1. PRI lines are limited to 48B channels.

Table 2-35 CTX100 Base and Expansion: 72 stations and 40 T1 and/or PRI lines

S101	S102	S103	S104[1]	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RxTU2	ADKU	RxTU2[2]	BDKU/ BDKS	BDKU/ BDKS	
16 DKTs	16 DKTs	24 lines	8 DKTs	16 lines	16 DKTs	16 DKTs	

1. S104, only 8 DKTs because of cabinet power factor.
2. RxTU2 could be RDTU2 (T1), RPTU2 or BPTU (PRI).

Table 2-36 CTX100 Base and Expansion: 56 stations and 56 T1 and/or PRI lines

S101	S102	S103	S104[1]	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RxTU2	ADKU	RxTU2[2]	Vacant (Shared)	RDTU2	BDKU/ BDKS
16 DKTs	16 DKTs	24 lines	8 DKTs	24 lines		8 lines	16 DKTs

1. S104, only 8 DKTs because of cabinet power factor.
2. RxTU2 could be RDTU2 (T1), RPTU2 or BPTU (PRI).

Table 2-37 CTX100 Base and Expansion: 48 stations and 64 T1 and/or PRI lines

S101	S102	S103	S104[1]	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RxTU2	ADKU	RxTU2[2]	Vacant (Shared)	RDTU2	ADKU
16 DKTS	16 DKTS	24 lines	8 DKTS	24 lines		16 lines	8 DKTs

1. S104, only 8 DKTs because of cabinet power factor.
2. RxTU2 could be RDTU2 (T1), RPTU2 or BPTU (PRI).

CTX100 Base Only: Digital Telephones and Analog Tie, DID, and/or Ground Start Lines

Table 2-38 CTX100 Base Cabinet with Analog Tie, DID and /or Ground Start Lines

4 Universal Slots 40 Stations (Max.) 16 CO lines (Max.) 40 Stations + Analog Tie, DID, Ground Start Lines combined (Max.)		
Table No.	**Stations**	**Analog Tie, DID, and/or Ground Start Lines**
2-39	40	4 line (Ground Start only)
2-40	32	8 lines (4 Tie/DID max.).
2-41	24	8 line any type
2-42	16	12 line any type
2-43	0	16 line any type

Table 2-39 CTX100 Base: 40 stations, 4 Ground Start Lines

S101	S102	S103	S104
BDKU/ BDKS	BDKU/ BDKS	ADKU	RGLU[1]
16 DKTs	16 DKTs	8 DKTs	4 lines

1. RGLU ground start lines only because of cabinet power factor.

Table 2-40 CTX100 Base: 32 stations, 4 Tie or DID and 4 Ground Start Lines

S101	S102	S103	S104
BDKU/ BDKS	BDKU/ BDKS	RxxU[1]	RGLU[2]
16 DKTs	16 DKTs	4 lines	4 lines

1. RxxU can be REMU (Tie) or RDDU (DID).
2. RGLU ground start lines only because of cabinet power factor.

Table 2-41 CTX100 Base: 24 stations, 8 Tie, DID and/or Ground Start Lines

S101	S102	S103	S104
BDKU/ BDKS	ADKU	RxxU[1]	RxxU
16 DKTs	8 DKTs	4 lines	4 lines

1. RxxU can be REMU (Tie), RDDU (DID), or RGLU ground start lines.

Table 2-42 CTX100 Base: 16 stations, 12 Tie, DID and/or Ground Start Lines

S101	S102	S103	S104
BDKU/ BDKS	RxxU	RxxU[1]	RxxU
16 DKTs	4 lines	4 lines	4 lines

1. RxxU can be REMU (Tie), RDDU (DID), or RGLU ground start lines.

Table 2-43 CTX100 Base: 0 stations, 16 Tie, DID and/or Ground Start Lines

S101	S102	S103	S104
RxxU[1]	RxxU	RxxU	RxxU
4 lines	4 lines	4 lines	4 lines

1. RxxU can be REMU (Tie), RDDU (DID), or RGLU ground start lines.

CTX100: Analog Tie, DID and/or Ground Start Lines

Table 2-44 CTX100 Base and Expansion Cabinet with Analog Tie, DID and/or Ground Start Lines

8 Universal Slots 72 Stations (Max.) 32 CO lines (Max.) 80 Stations + Analog Tie, DID and/or Ground Start Lines combined (Max.)		
Table No.	**Stations**	**Analog Tie, DID, and/or Ground Start Lines**
2-45	72	12 lines (4 Tie/DID max.)
2-46	64	16 lines (8 Tie/DID max.)
2-47	56	16 lines (12 Tie/DID max.)
2-48	48	16 lines any type
2-49	48	20 lines (16 Tie/DID max.)
2-50	32	24 lines any type
2-51	16	28 lines any type

Table 2-45 CTX100 Base & Expansion: 72 stations, 4 Tie or DID and 8 Ground Start Lines

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	ADKU	RGLU[2]	BDKU/ BDKS	BDKU/ BDKS	RxxU[1]	RGLU[2]
16 DKTs	16 DKTs	8 DKTs	4 lines	16 DKTs	16 DKTs	4 lines	4 lines

1. RxxU can be REMU (Tie), RDDU (DID), or RGLU ground start lines.
2. RGLU can not be substituted with REMU or RDDU because of cabinet power factor.

Table 2-46 CTX100 Base & Expansion: 64 stations, 8 tie or DID and 8 Ground Start Lines

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RxxU	RGLU[2]	BDKU/ BDKS	BDKU/ BDKS	RxxU[1]	RGLU[2]
16 DKTs	16 DKTs	4 lines	4 lines	16 DKTs	16 DKTs	4 lines	4 lines

1. RxxU can be REMU (Tie), RDDU (DID), or RGLU ground start lines.
2. RGLU can not be substituted with REMU or RDDU because of cabinet power factor.

Table 2-47 CTX100 Base & Expansion: 56 stations, 12 Tie or DID and 4 Ground Start Lines

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	ADKU	RxxU	RxxU	BDKU/ BDKS	BDKU/ BDKS	RxxU[1]	RGLU[2]
16 DKTs	8 DKTs	4 lines	4 lines	16 DKTs	16 DKTs	4 lines	4 lines

1. RxxU can be REMU (Tie), RDDU (DID), or RGLU ground start lines.
2. RGLU can not be substituted with REMU or RDDU because of cabinet power factor.

Table 2-48 CTX100 Base & Expansion: 48 stations, 16 Tie, DID and/or Ground Start Lines

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	ADKU	RxxU[1]	RxxU	BDKU/ BDKS	ADKU	RxxU	RxxU
16 DKTs	8 DKTs	4 lines	4 lines	16 DKTs	8 DKTs	4 lines	4 lines

1. RxxU can be REMU (Tie), RDDU (DID), or RGLU ground start lines.

Table 2-49 CTX100 Base & Expansion: 48 stations, 16 Tie or DID and 4 Ground Start Lines

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	BDKU/ BDKS	RxxU[1]	RGLU[2]	BDKU/ BDKS	RxxU	RxxU	RxxU
16 DKTs	16 DKTs	4 lines	4 lines	16 DKTs	4 lines	4 lines	4 lines

1. RxxU can be REMU (Tie), RDDU (DID), or RGLU ground start lines.
2. RGLU can not be substituted with REMU or RDDU because of cabinet power factor.

Table 2-50 CTX100 Base & Expansion: 32 stations, 24 Tie, DID and/or Ground Start Lines

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	RxxU[1]	RxxU	RxxU	BDKU/ BDKS	RxxU	RxxU	RxxU
16 DKTs	4 lines	4 lines	4 lines	16 DKTs	4 lines	4 lines	4 lines

1. RxxU can be REMU (Tie), RDDU (DID), or RGLU ground start lines.

Table 2-51 CTX100 Base & Expansion: 16 stations, 28 lines

S101	S102	S103	S104	S105	S106	S107	S108
BDKU/ BDKS	RxxU[1]	RxxU	RxxU	RxxU	RxxU	RxxU	RxxU
16 DKTs	4 lines	4 lines	4 lines	4 lines	4 lines	4 lines	4 lines

1. RxxU can be REMU (Tie), RDDU (DID), or RGLU ground start lines.

Worksheet 6: Strata CTX670 Cabinet Slots

The cabinet diagram below enables you to write in the PCBs installed in each cabinet slot. Use the PCB placement guideline below to place PCBs in the correct slots. Fill in the PCBs that go into each slot from the PCB quantities determined in the worksheets on the previous pages and the information provided in this worksheet. After completing Worksheet 6, Worksheet 7 must be completed to verify that the cabinet power factors do not exceed 85.

Main Location _______________ **Remote Location** 1___ 2___ 3___ 4___ 5___ 6___

CTX Cabinet Slots										
Base	**B101**	**B102**	**S101**	**S102**	**S103**	**S104**	**S105**	**S106**	**S107**	**S108**
PCB Type	**BEXU**	**BCTU** (AMDS, BSIS)								
	BECU (BEXS, BSIS)	**BBCU** (BBMS)								
Cab 2	**S201**	**S202**	**S203**	**S204**	**S205**	**S206**	**S207***	**S208***	**S209***	**S210***
PCB Type										
Cab 3	**S301**	**S302**	**S303**	**S304**	**S305**	**S306**	**S307***	**S308***	**S309***	**S310***
PCB Type										
Cab 4	**S401**	**S402**	**S403**	**S404**	**S405**	**S406**	**S407***	**S408***	**S409***	**S410***
PCB Type										
Cab 5	**S501**	**S502**	**S503**	**S504**	**S505**	**S506**	**S507***	**S508***	**S509***	**S510***
PCB Type										
Cab 6	**S601**	**S602**	**S603**	**S604**	**S605**	**S606**	**S607***	**S608***	**S609***	**S610***
PCB Type										
Cab 7	**S701**	**S702**	**S703**	**S704**	**S705**	**S706**	**S707***	**S708***	**S709***	**S710***
PCB Type										

Notes

- B101/B102 – Main processor slots. AMDS, BEXS, BBMS, BSIS are optional subassembly PCBs (see "CTX100 Processor Optional Subassemblies" on page 2-3).
- Cabinet slots marked with * provide 8 time slots; all other slots provide 16 time slots.
- BIPU-M and BIPU-Q can be installed in slots with 16 time slots only. Slots that provide 8 time slots (marked with *) do not support BIPU cards. BIPU PCBs can only be placed in 16 channel slots.

  Important! *If a BIPU-M or BIPU-Q is installed RCOU1A, RCOS1A RDDU1A, RGLU1A, RGLU2A, and two-wire REMU cards should not be installed to avoid excessive Echo Return Loss (ERL).*
- Any combination of up to 96 (basic processor) or 264 (expanded processor) RPTU, BPTU and RDTU channels can be installed in the CTX670.
- RDTU, BPTU and RPTU PCBs can only be placed in odd slots of the Base Cabinet and slots S_01, S_03, and S_05 in any Expansion Cabinet. If 17 or more channels are used, the next highest slot adjacent to the RDTU, BPTU, or RPTU slot *cannot* be used. Slots adjacent to 8 or 16 channel RDTU, BPTU or RPTU PCBs can be used.
- The maximum number of RDTU and/or RPTU cards is determined by the CTX system line capacity. Any number of line interface cards (RDTU, RPTU, BPTU, RCOU/RCOS, REMU, RDDU, RGLU, BIPU-Q1A) can be installed, providing that the quantity of lines and channels do not exceed the CTX system's line capacity.
- If only 16 B channels of PRI are needed, another card can be installed in the next slot. The position of D-channels can still be set to the 24th channel because the data of the D-channel is passed through the data highway, not the PCM highway. The position of the D-channel doesn't affect the installation of cards in the CTX.
- Network clock signals can only be derived from digital trunk PCBs, such as the RDTU and RPTU, that are installed in the Base Cabinet (Master) location. Do not install these digital trunk cards into the Remote Cabinets.
- BDKU, PDKU, RDSU without Speaker OCA can be in any available slot in any cabinet. BDKU, PDKU, RDSU with Speaker OCA can be in any available slots in the Base and S_01~S_06 in all Exp. Cabs.
- BDKU/BDKS or BWDKU without Speaker OCA can be in any available slots in the Base and S_01~S_06 in the Expansion Cabs. **It is recommended you not install Speaker OCA telephones on the BWDKU or BDKU/BDKS. If you do, it must be in an odd slot and the next slot must be vacant.**
- If the BWDKU is placed in slots 7~10, it must be set for 8 circuits with PCB jumper and in Program 100.
- Maximum 80 digital telephones per shelf due to the Power Factor restriction.
- For more details, see the following Placement Guidelines section.

PCB Placement Guidelines

Install the RRCU PCBs in the Base Cabinet first. Station, line and option PCBs can be mixed in cabinets in any pattern. Do not skip slots except for vacant slots that provide RDTU, BPTU or RPTU capacity. Also, do not skip slots except for vacant slots that provide for BBKU/BDKS with Speaker OCA. Refer to Tables 2-54 and 2-55. Toshiba recommends placing the RDTU, BPTU or RPTU, BWDKU and BDKU/BDKS PCBs first because they have special placement rules. Use the following numbered sequence as a guide to installing the PCBs.

Important! *When placing PCBs, do not install more than five BWDKU or BDKU/BDKS PCBs in the same cabinet. Five BWDKU or BDKU/BDKS PCBs support 80 digital telephones, which brings the cabinet power factor to 82.25. Adding more PCBs of any type to a cabinet that has five BWDKU or BDKU/BDKS PCBs may cause the cabinet to exceed its power factor (85 max.). See Worksheet 7.*

Step 1: Processor PCBs

- BCTU (slot B102) or the older BECU (Slot B101)/ BBCU (slot B102), are required for system operation.
- The BCTU will support up to two cabinets without the BEXU. With the BEXU, up to 7 cabinets are supported.
- The BECU/BBCU supports up to two cabinets without the BEXS/BBMS expansion subassemblies. BEXS and BBMS subassembly PCBs are required for 3 to 7 cabinet systems.
- BSIS subassembly PCB is required for SMDR and/or SMDI or Toshiba Proprietary Voice Mail RS-232 interface.

Note The BECU/BBCU and BCTU is licensed for 64 ports and four DTMF receivers from the factory. If more capacity is required additional licenses must be uploaded to the processor. See “Worksheet 9 – Software Licenses” on page 2-54.

Step 2: Remote Cabinet PCBs

- RRCU PCBs installed in the main location must be placed in Base Cabinet slots S102~S108 in any order. Before installing other PCBs make sure there is a Base Cabinet slot available for each RRCU PCB needed. An RRCU may occupy a vacant slot adjacent to RDTU, BPTU or RPTU. An RRCU PCB in a remote location can support one or two remote cabinets and can be installed in any slot of either cabinet.

  The number of RRCU PCBs required in the Base and Remote Cabinet locations is shown in Table 2-52:

Table 2-52 Main Processor PCB/ Remote Cabinet Configuration

RRCU PCBs Needed in Base Cabinet	Remote Cabinet Configuration	RRCU PCBs Needed at Remote Location (s)
1	1 or 2 Remote Cabinets in one location	1
2	2 to 4 Remote Cabinets in two locations or 3 to 4 Remote cabinets in one location.	2
3	3 cabinets if cabinets are in separate remote locations.	3
4	4 cabinets if cabinets are in separate remote locations.	4
5	5 cabinets if cabinets are in separate remote locations.	5
6	6 cabinets if cabinets are in separate remote locations.	6

- Cables are provided according to the connectors on the RRCU card to which they are attached. See Table 2-53 for connector information.

Table 2-53 Remote Cabinet Data Cables and Connectors

Data Cables	RRCU Connectors			
	M1	S1	M2	S2
BDCL1A-MS1	X	X		
BDCL1A-M2			X	
BDCL1A-S2				X

X = Applies to connector.

Step 3: BIOU Interface PCB

- Up to two BIOU PCBs can be installed in any local/remote cabinet slot, except the BIOU may not occupy a vacant slot adjacent to RDTU, BPTU or RPTU. See “Worksheet 4: Page/MOH/ Control Relay” on page 2-26 for BIOU functions.

Step 4: T1 Digital Line PCBs

- See Worksheet 3: CO Line to determine RDTU PCB requirements.
- RDTU must be placed in designated slots as shown in Table 2-54. The RDTU PCB can provide up to 16 or 24 T1 lines. The RDTU slot provides 16 T1 lines, an additional eight lines requires that the cabinet slot adjacent to RDTU be vacant. Up to 11 RDTU PCBs can be installed in a fully expanded system

Table 2-54 RDTU PCB Cabinet Slot Configuration

T1 Channels Needed per Cabinet	Slots Needed	RDTU PCBs Needed[1]	RDTU cabinet slot placement[1]
Base Cabinet			
1~16	1	1	S103-RDTU
17~24	2		S104-vacant[2]
24~40	3	2	S105-RDTU
41~48	4		S106-vacant[2]
49~64	5	3	S107-RDTU
65~72	6		S108-vacant[2]
Second through seventh cabinets			
1~16	1	1	S_01- RDTU
17~24	2		S_02-vacant[2]
25~40	3	2	S_03- RDTU
41~48	4		S_04-vacant[2]
49~64	5	3	S_05-RDTU
65~72	6		S_06-vacant[2]

1. RDTU PCBs do not have to be installed in the order shown in this table. Example: If only one RDTU is needed, it can be installed in any RDTU slot shown in the table so long as the slot is supported by the installed processor.
2. The slot occupied by RDTU supports 1-16 channels; the slot adjacent to RDTU must be vacant if channels 17 through 24 are needed.

Strata CTX Configuration

Step 5: ISDN PRI Digital Line PCBs

See Worksheet 3: CO Line to determine RDTU PCB requirements.

The BPTU or RPTU must be placed in designated slots as shown in Table 2-55. The BPTU or RPTU PCB can provide up to 16 or 23 ISDN PRI lines. The BPTU or RPTU slot provides 16 PRI lines, an additional seven lines requires that the cabinet slot adjacent to BPTU or RPTU be vacant. Up to 11 RDTU PCBs can be installed in a fully expanded system.

Important! *BPTU1 or RPTU2 is required for QSIG Networking.*

Table 2-55 BPTU or RPTU PCB Cabinet Slot Configuration

PRI Lines Needed per Cabinet	Slots Needed	BPTU or RPTU PCBs Needed[1]	BPTU or RPTU cabinet slot placement[1]
Base Cabinet			
1~16	1	1	S103 – BPTU or RPTU
17~23	2		S104-vacant[2]
24~39	3	2	S105 – BPTU or RPTU
40~46	4		S106-vacant[2]
47~62	5	3	S107 – BPTU or RPTU
63~69	6		S108-vacant[2]
Second through seventh cabinets			
		1	
1~16	1		S_01 – BPTU or RPTU
17~23	2		S_02-vacant[2]
24~39	3	2	S_03 – BPTU or RPTU
40~46	4		S_04-vacant[2]
47~62	5	3	S_05 – BPTU or RPTU
63~69	6		S_06-vacant[2]

1. BPTU or RPTU PCBs do not have to be installed in the order shown in this table. Example: If only one BPTU or RPTU is needed, it can be installed in any BPTU or RPTU slot shown in the table so long as the slot is supported by the installed processor.
2. The slot occupied by RPTU supports 1-16 channels; the slot adjacent to RPTU must be vacant if channels 17 through 23 are needed.

Step 6: Digital and Standard Telephone Station PCBs and the Stratagy DK Voice Mail PCB

- See Worksheet 2: Standard Telephone, Stratagy DK, IVP8 to determine station PCB requirements.
- BDKU (+ optional BDKS), PDKU, ASTU, BSTU, RSTU, RDSU/RSTS and the Stratagy DK: Each PCB or PCB combination requires one slot. Refer to the Notes under the cabinet diagram in Worksheet 6: Strata CTX670 Cabinet Slots to determine into which slots these PCBs can be installed. BDKU/BDKS, PDKU, ASTU, BSTU, RSTU and RDSU/RSTS PCBs cannot be installed in slots left vacant for RDTU or BPTU or RPTU. Each PCB provides up to eight circuits for the type of stations or Voice Mail ports it supports, except BDKU with BDKS which provides 16 circuits for digital telephones.

Step 7: ISDN BRI Digital Station PCBs

- See Worksheet 3: CO Line to determine BRI station PCB requirements.
- RBUU, RBUU with RBUS, RBSU, RBSU with RBSS: Each PCB or PCB combination requires one slot. These PCBs can be installed in any slot, except a slot is left vacant to provide capacity for RDTU, BPTU or RPTU as shown in Tables 2-54 and 2-55. Each single PCB provides two BRI circuits and combination PCBs provide four BRI circuits, for the type of BRI stations it supports. Each ISDN BRI station requires one BRI circuit.

Step 8: Analog and VoIP Tie Line PCBs

- See Worksheet 3: CO Line to determine Analog and BVPU line PCB requirements.
- RDDU, RCOU, RCOU with RCOS, RGLU, REMU, and BVPU: Each PCB or PCB combination requires one slot. These PCBs can be installed in any slot, except a slot that is left vacant to provide capacity for RDTU, BPTU or RPTU as shown in Tables 2-54 and 2-55. Each PCB provides up to four circuits for the type of lines it supports, except RCOU with RCOS which provides eight circuits.

Step 9: ISDN BRI Digital Line PCBs

- See Worksheet 3: CO Line to determine ISDN BRI line PCB requirements.
- RBUU, RBUU with RBUS, RBSU, RBSU with RBSS: Each PCB or PCB combination requires one slot. These PCBs can be installed in any slot, except a slot that is left vacant to provide capacity for RDTU, BPTU or RPTU as shown in Tables 2-54 and 2-55. Each single PCB provides 2 BRI circuits (four lines) and combination PCBs provide four BRI circuits (8 lines), for the type of BRI Line it supports. Each ISDN BRI circuit provides two lines for the Strata CTX system.

Step 10: Power Factor

- After the Cabinets are configured calculate the power factor of each cabinet using Worksheet 7 – System Power Factor Check.

Step 11: Check Systems Capacities

- Check systems capacities in Tables 2-3~2-7 to confirm the features to be used are within limitations.

Worksheet 7 – System Power Factor Check

The Strata CTX power supply was engineered for maximum cost efficiency to provide power for the most configurations. Because of this design, there are some -24VDC power limitations for telephone option hardware.

Each telephone/device and PCB has been assigned Power Factors (PFs) that reflect the amount of power supply resources they consume. The Power Supply Unit has also been assigned Power Factors that reflect how much power it can supply. To make sure the cabinet power supply is operating within its limit, it is necessary to add up the PFs of each telephone/device and PCB installed in each cabinet to verify that their total PFs do not exceed the Power Supply PF.

Use the worksheets on pages 2-44~2-45 to calculate that each cabinet's PF is within limits.

Important!

Power Factor Considerations:

- *The individual PCB and telephone power factors can be found on pages 2-43 and 2-44.*
- *The sum of all PCB and telephones* ***–24VDC PFs*** *in a given cabinet cannot exceed:*

  85 for CTX670

  45 for CTX100
- *The sum of all PCB* ***+5VDC PFs*** *in a given cabinet cannot exceed:*

  40 for CTX670

  20 for CTX100

  Telephones do not have +5VDC PFs.
- *If a cabinet PF is exceeded it is necessary to reconfigure the cabinet to meet PF limits.*
- *If a cabinet's Power Factor is exceeded, cabinet or connected peripherals may malfunction during ringing or voice paging, whereas normal operation will occur for idle telephones.*
- *The Strata CTX100 and CTX670 power supplies provide a PF alarm LED and reset button. If this LED is on, reset it with the reset button. Then recheck the cabinet PFs to make sure they are within limits.*

PCB Power Factor calculation examples are shown in Tables 2-56 and 2-57.

Table 2-56 Strata CTX Base Cabinet Example

PCB	Quantity	+5VDC PF	-24VDC PF
PDKU	2	1.6	0.6
RBSU + RBSS	1	3.1	0.3
RCOU + RCOS	1	3.6	4.0
BBCU	1	4.5	2.0
BECU	1	4.5	2.0
Total	6	17.3	8.9

Table 2-57 Strata CTX Expansion Cabinet Example

PCB	Quantity	+5VDC PF	-24VDC PF
RBSU + RBSS	1	3.1	0.3
RCOU + RCOS	1	3.6	4.0
Total	2	6.7	4.3

Table 2-58 shows the individual PCB +5VDC and -24VDC power factors. -24VDC PF numbers for telephones and devices are shown on page 2-44; telephones do not require +5VDC PF considerations.

Table 2-58 PCB and Power Supply Power Factors

PCB Type	+5VDC PF	-24VDC PF
ACTU1, 2	1.1	0.5
ADKU	0.8	0.3
AETS	0.2	0.1
ARCS	0.0	0.0
AMDS	1.3	0.5
ASTU	0.3	0.5
BCTU	8.5	3.4
BEXU	4.0	1.6
BBCU1	4.5	2.0
BECU1	4.5	2.0
BEXS1	2.0	1.0
BBMS1	0	0
BDKU1	0.8	0.3
BDKS1	0.4	0.15
BIOU1	1.5	6.6
BIPU-M2A, BIPU-M1A/ BIPU-Q1A	0.1	3.0
BPTU1	2.3	0.7
BSIS1	1.0	0.5
BSTU1 (-24VDC)	1.4	1.0
BSTU1 + R48S (-48VDC)	1.4	2.3
BVPU1‘	0.0	3.5
BWDKU	0.8	0.3
PCOU1, 2	1.9	2.0
PDKU1, 2	0.8	0.3
R40S1	0.0	2.8
RBSS1	0.6	0.3
RBSS2	0.0	0.3
RBSU + RBSS	3.1	0.3
RBSU1	2.5	1.0
RBSU2	0.0	1.0
RBUS1	0.0	0.3
RBUU1	0.0	1.0

PCB Type	+5VDC PF	-24VDC PF
RCIS1	0.3	0.1
RCIU1, 2	0.7	0.2
RCIU2	0.7	0.2
RCMS1	0.6	0.3
RCOS1, 2	1.7	2.0
RCOU (4 CO)	2.5	2.0
RCOU + RCOS (8 CO)	3.6	4.0
RCOU1, 2	1.9	2.0
RDDU1	2.6	7.0
RDSU1 (-24VDC)	1.1	0.3
RDSU1 + R48S1 (-48VDC)	1.1	0.5
RDTU1, 2	1.8	1.0
RDTU3	0.2	0.6
REMU2/PEMU1	1.0	7.5
RGLU1, 2	2.1	2.5
RMCU1	0.7	0.3
RPTU1, 2	2.6	1.0
RSTU1, 2, 3 (-24VDC)	1.4	0.5
RSTU1+ R48S (-48VDC)	1.4	1.0
RSTU2, 3 + R48S (-48VDC)	4.0	2.3
RRCU1	0.0	4.0
Stratagy iES32, 32 circuits	0	14
Stratagy iES32, 16-circuits	0	14
Stratagy IVP8	4.0	2.3
Power Supply APSU112 (CTX100)	(20.0)	(45.0)
Power Supply BPSU672 (CTX670)	(40.0)	(85.0)

Telephone/Device Power Factors

The power supply of each cabinet supplies a limited amount of power. Use the Worksheet below to calculate the total Telephone/Device -24 VDC PF for each cabinet. Add it to the appropriate cabinet in "Cabinet Power Factor Check" on page 2-45. Telephones do not have +5VDC PFs.

Main Location _______________ Remote Location 1___ 2___ 3___ 4____ 5___ 6____

Telephone/ Device	Cabinet 1 (Base)			Cabinet 2 (Exp.)			Cabinet 3 (Exp.)			Cabinet 4 (Exp.)		
	Qty.	-24 VDC PF	Total	Qty.	-24 VDC PF	Total	Qty.	-24 VDC PF	Total	Qty.	-24 VDC PF	Total
DKT (any series)		x 1.0 =			x 1.0 =			x 1.0 =			x 1.0 =	
DDCB (with MDFB)		x 1.2 =			x 1.2 =			x 1.2 =			x 1.2 =	
DDSS Console		x 0.8 =			x 0.8 =			x 0.8 =			x 0.8 =	
Add-on Module (DADM)		x 0.4 =			x 0.4 =			x 0.4 =			x 0.4 =	
BATI		x 0.7 =			x 0.7 =			x 0.7 =			x 0.7 =	
Integrated BPCI		x 0.2 =			x 0.2 =			x 0.2 =			x 0.2 =	
Standard Phone (-48VDC)		x 1.0 =			x 1.0 =			x 1.0 =			x 1.0 =	
Standard Phone (-24VDC)		x 0.5 =			x 0.5 =			x 0.5 =			x 0.5 =	
Power Failure Unit (DPFT)		x 3.0 =			x 3.0 =			x 3.0 =			x 3.0 =	
HHEU or BHEU		x 0.1 =			x 0.1 =			x 0.1 =			x 0.1 =	
BVSU or DVSU		x 0.2 =			x 0.2 =			x 0.2 =			x 0.2 =	
Total Power Factor (PF)	**Telephone PF ____**			**Telephone PF ____**			**Telephone PF ____**			**Telephone PF ____**		

Telephone/Device	Cabinet 5 (Exp.)			Cabinet 6 (Exp.)			Cabinet 7 (Exp.)		
	Qty.	-24 VDC PF	Total	Qty.	-24 VDC PF	Total	Qty.	-24 VDC PF	Total
DKT (any series)		x 1.0 =			x 1.0 =			x 1.0 =	
DDCB (w.MDFB)		x 1.2 =			x 1.2 =			x 1.2 =	
DDSS Console		x 0.8 =			x 0.8 =			x 0.8 =	
Add-on Module		x 0.4 =			x 0.4 =			x 0.4 =	
BATI		x 0.7 =			x 0.7 =			x 0.7 =	
Integrated BPCI		x 0.2 =			x 0.2 =			x 0.2 =	
Standard Telephone (-48VDC)		x 1.0 =			x 1.0 =			x 1.0 =	
Standard Telephone (-24VDC)		x 0.5 =			x 0.5 =			x 0.5 =	
Power Failure Unit (DPFT)		x 3.0 =			x 3.0 =			x 3.0 =	
HHEU or BHEU		x 0.1 =			x 0.1 =			x 0.1 =	
BVSU or DVSU		x 0.2 =			x 0.2 =			x 0.2 =	
Total Power Factor (PF)	**Telephone PF ____**			**Telephone PF ____**			**Telephone PF ____**		

Note PF varies by number of telephones because of station paging limit of 32 telephones. Always use "1.0" for DKT telephones when calculating PFs for individual cabinets.

Cabinet Power Factor Check

1. Enter the PCB Type and PCB Power Factor for each cabinet slot (see Worksheets 5 and 7 for PCB slot configuration).
2. Total the PCB PF for each cabinet.
3. Enter the Total Telephone PF for each cabinet (from the Telephone/Device Worksheet on the previous page).
4. Make sure the Total Cabinet PFs do not exceed the limits noted below. If either PF exceeds its limit, adjust the PCB/telephone placement to meet the PF requirement.

Note Total +5VDC PF of PCBs must be less than 20 for each CTX100 cabinet and 40 for each CTX670 cabinet. Total -24VDC PF of PCBs and telephones must be less than 45 for each CTX100 cabinet and 85 for each CTX670 cabinet.

CTX100

CTX100 Base Cabinet			
Slot	**PCB Type**	**PCB +5VDC PF**	**PCB -24VDC PF**
ACTU	ACTU	2.6	1.1[1]
S101			
S102			
S103			
S104			
S109	ASTU		
Total PCB PF			
Total Phone PF			
Total Cabinet PF			

CTX100 Expansion Cabinet			
Slot	**PCB Type**	**PCB +5VDC PF**	**PCB -24VDC PF**
S105			
S106			
S107			
S108			
Total PCB PF			
Total Phone PF			
Total Cabinet PF			

1. Power factor includes ACTU and all ACTU option PCBs.

CTX670

CTX670 Cabinet 1 (base)			
Slot	**PCB Type**	**PCB +5VDC PF**	**PCB -24VDC PF**
B101			
B102			
S101			
S102			
S103			
S104			
S105			
S106			
S107			
S108			
Total PCB PF			
Total Phone PF			
Total Cabinet PF			

CTX670 Cabinet 2			
Slot	**PCB Type**	**PCB +5VDC PF**	**PCB -24VDC PF**
S201			
S202			
S203			
S204			
S205			
S206			
S207			
S208			
S209			
S210			
Total PCB PF			
Total Phone PF			
Total Cabinet PF			

CTX670 Cabinet 3			
Slot	**PCB Type**	**PCB +5VDC PF**	**PCB -24VDC PF**
S301			
S302			
S303			
S304			
S305			
S306			
S307			
S308			
S309			
S310			
Total PCB PF			
Total Phone PF			
Total Cabinet PF			

CTX670 Cabinet 4			
Slot	**PCB Type**	**PCB +5VDC PF**	**PCB -24VDC PF**
S401			
S402			
S403			
S404			
S405			
S406			
S407			
S408			
S409			
S410			
Total PCB PF			
Total Phone PF			
Total Cabinet PF			

CTX670 Cabinet 5			
Slot	**PCB Type**	**PCB +5VDC PF**	**PCB -24VDC PF**
S501			
S502			
S503			
S504			
S505			
S506			
S507			
S508			
S509			
S510			
Total PCB PF			
Total Phone PF			
Total Cabinet PF			

CTX670 Cabinet 6			
Slot	**PCB Type**	**PCB +5VDC PF**	**PCB -24VDC PF**
S601			
S602			
S603			
S604			
S605			
S606			
S607			
S608			
S609			
S610			
Total PCB PF			
Total Phone PF			
Total Cabinet PF			

CTX670 Cabinet 7			
Slot	**PCB Type**	**PCB +5VDC PF**	**PCB -24VDC PF**
S701			
S702			
S703			
S704			
S705			
S706			
S707			
S708			
S709			
S710			
Total PCB PF			
Total Phone PF			
Total Cabinet PF			

Worksheet 8 – CTX Primary AC and Reserve Power

CTX100 AC Power Considerations

The power supply in each Strata CTX100 Base and Expansion Cabinet furnishes power to all of the stations and some of the interface peripherals (see Table 2-59). The primary AC power for each cabinet is 120VAC.

Table 2-59 Strata CTX100 Electrical Characteristics

Strata CTX100 Primary AC Power Voltage		
Input AC AC Frequency Watts per cabinet (maximum)		120VAC 60 Hz, Single-phase (48Hz~62Hz) 100 watts (maximum)
Strata CTX100 Primary Power Current Consumption (Rating in Amperes)		
	120VAC	
1 cabinet	1.8 amps	
2 cabinets	3.6 amps	
Power Supply Unit (APSU112A)		
DC voltage output specification		-24VDC (-26.3~-27.8VDC, 3.2 DC amps) +5VDC (+4.5~5.5VDC, 2.0 DC amps) -5VDC (-4.5~-5.5VDC, 0.2 DC amps) +3.3VDC (+3.0~3.6VDC, 0.5 DC amps

CTX670 AC Power Considerations

The power supply in each Strata CTX670 Base and Expansion Cabinet furnishes power to all of the stations and some of the interface peripherals (see Table 2-60). The primary AC power can be 120VAC, 208VAC or 240VAC. Systems containing six or seven cabinets require 208VAC or 240VAC.

Table 2-60 Strata CTX670 Electrical Characteristics

Strata CTX670 Primary AC Power Voltage			
Input AC AC Frequency Watts per cabinet (continuous) Watts for five cabinet system		115±10VAC or 208±20VAC or 240±20VAC 50/60 Hz, Single-phase (48~62Hz) 180 900	
Strata CTX670 Primary Power Current Consumption (Rating in Amperes)			
	120VAC	208VAC	240VAC
1 cabinet	3.2 amps	2.2 amps	2.0 amps
2 cabinets	6.4 amps	4.4 amps	4.0 amps
3 cabinets	9.6 amps	6.6 amps	6.0 amps
4 cabinets	12.8 amps	8.8 amps	8.0 amps
5 cabinets	16.0 amps	11.0 amps	10.0 amps
6 cabinets	N/A	13.2 amps	12.0 amps
7 cabinets	N/A	15.4 amps	14.0 amps
Power Supply Unit (BPSU672)			
DC voltage output specification		-24VDC (-26.3~-27.8VDC, 6.0 DC amps) +5VDC (+4.5~5.5VDC, 4.0 DC amps) -5VDC (-4.5~-5.5VDC, 0.8 DC amps)	

Determine CTX670 system miscellaneous power components in the following worksheet. (See Tables 2-63 and 2-66 for component descriptions.) These components are not used on CTX100 systems.

Enter the number of cabinet power components needed:

Main Location ____________ Remote Location 1___ 2___ 3___ 4____5___ 6____

CTX670 Cabinet Power Components	Enter the Number Required	
Spare Power Supply	BPSU672	
AC Power Strips	RPSB2	
	BPSB240	
208/240VAC Power Supply Cord	BACL240	
Battery Cables	PBTC-3M	
	BBTC1A-2.0M	
Battery DIstribution Box	BBDB	
Conduit Box	BCCB120	
	BCCB240	
Floor Mount Stand	BFIF	

Reserve Power (CTX100 and CTX670)

Two or four customer-supplied 12VDC reserve batteries (80 ampere-hours max.) can be connected to either system to maintain normal operation during a power failure (see Tables 2-61~2-64). The batteries are kept in a highly-charged state by the power supply's battery charger and must be connected when the system is operating normally. Fully charged batteries must be connected when normal AC power is available, batteries cannot be connected after/during an actual power failure.

The battery changer is standard on the CTX670 power supply. An optional ABCS battery changer must be used in the CTX100 power supply.

Table 2-61 CTX100 Reserve Power Characteristics

Battery Charger Characteristics	Maximum Battery Charger Drain (-24VDC)	
Charger: current limiting Nominal float voltage: 2.275 volts/cell Charge current: 280mA amps maximum Battery discharge cut-off voltage: 20.5 ±0.5VDC	Base Cabinet Base + Expansion Cabinets	3.15 amps 6.30 amps

Table 2-62 CTX100 Typical Reserve Power Duration Estimates[1]

Number of Cabinets	1	2
Estimated operation time Two-battery configuration	25 hr.	12.5 hr.
Estimated operation time Four-battery configuration	50 hr.	25 hr.
DC Current Drain (-24VDC)	3.15 amps.	6.30 amps.

1. Assumes 80 ampere-hours with 12VDC batteries.

Table 2-63 CTX670 Reserve Power Characteristics

Battery Charger Characteristics	Maximum Battery Charger Drain (-24VDC)			
Charger: current limiting Nominal float voltage: 2.275 volts/cell Charge current: 0.7 amps maximum Battery discharge cut-off voltage: 20.5 ±0.5VDC	1 cabinet 2 cabinets 3 cabinets 4 cabinets	6.0 amps 12.0 amps 18.0 amps 24.0 amps	5 cabinets 6 cabinets 7 cabinets	30.0 amps 36.0 amps 42.0 amps

Table 2-64 CTX670 Typical Reserve Power Duration Estimates[1]

Number of Cabinets	1	2	3	4	5	6	7
Estimated operation time Two-battery configuration	12.0 hr.	6.0 hr.	4.0 hr.	3.0 hr.	2.5 hr.	2.0 hr.	1.8 hr.
Estimated operation time Four-battery configuration	24.0 hr.	12.0 hr.	8.0 hr.	6.0 hr.	5.0 hr.	4.0 hr.	3.5 hr.
DC Current Drain (-24VDC)	4.6 amps.	8.7 amps.	12.8 amps.	16.9 amps.	21.0 amps.	25.1 amps.	29.2 amps.

1. Assumes 80 ampere-hours with 12VDC batteries.

Primary/Reserve Power Cabinet Hardware

The type of cabinet mounting can have an effect the power requirements. There are two types of mounting for the CTX100 and CTX670 (listed below).

- **Cabinet Wall Mounting** – The lightweight and compact design of CTX100 and CTX670 enables easy wall mounting. Wall Mounting requires no special hardware.
- **Cabinet Floor Mounting** – Only the CTX670 can be floor mounted (requires the BFIF hardware kit). If floor mounting three or more cabinets, AC and reserve power must be connected to the BCCB conduit connection box option by a licensed electrician. If more than two cabinets require reserve power batteries, the BBDB must be installed.

Underwriters' Laboratory (UL) and local electrical codes require certain standards for connecting commercial AC and reserve power to the Strata CTX system. Tables 2-63 and 2-66 describe which assemblies may be required to meet UL and local electrical code standards.

The power distribution hardware for the CTX100 is shown in Table 2-65.

Table 2-65 CTX100 Cabinet Power Distribution Hardware

Option	Description
APSU112	Strata CTX100 cabinet power supply is supplied with each cabinet. Operates with 120VAC as the system's primary power source and requires 1.8 amps AC per cabinet. The power supply AC cord is 5 ft. long with a standard three prong plug.
ABTC-3M	A three-meter long battery cable is used to connect reserve power batteries to the ABCS battery charger when the system has less than three cabinets. One reserve power cable is required for each cabinet.
ABCS	Option battery charger that is installed on the APSU112 power supply. One per cabinet is required with the ABTC-3M if connecting reserve power batteries to the CTX100.

Table 2-66 CTX670 Power Cabinet Hardware

Option	Description
BPSU672	Strata CTX670 cabinet power supply must be ordered for each cabinet. Operates with 120VAC, 208VAC, or 240VAC connected as the system's primary AC power source. It automatically detects and adjusts to the type of primary AC power that is connected. The power supply is included with each cabinet ordered but must be installed in the field. Standard 9 ft. AC power cords with AC120VAC/15A plugs are provided with Strata CTX Base or Expansion cabinets. When AC208V or AC240V power is used, a special AC cord, BACL240, is required for each cabinet power supply and must be ordered separately.
RPSB2	Cabinet power strip for 120VAC primary power – provides three standard 120VAC/15A outlets (NEMA5-15R) and nine ft. AC power cord with standard 120VAC/15A plug (NEMA5-15P). This unit is field installed inside system cabinet side panels. The system can use 12 amps. (max.). One RPSB2 is required for two cabinet systems if the local electric code allows only one AC power cord to be connected to the system. If the local electric code allows only one AC power cord to be connected to the system, 208VAC or 240VAC must be used as primary AC power for systems with four or more cabinets. One RPSB2 is required for a three or four cabinet system if the local electric code allows two AC power cords connected to the system. Two RPSB2s are required for a five cabinet system if the local electric code allows two AC power cords connected to the system.
BPSB240	Cabinet power strip for 208VAC or 240VAC primary power - provides three 240VAC/20A outlets (NEMA 6-20R) and 9ft. AC power cord with a standard 240VAC/20A plug (NEMA 6-20P). This unit is field installed inside system cabinet side panels. The system can use 16 amps. (max.). One BPSB240 is required for two or three cabinet systems. Two BPSB240s are required for four or five cabinet systems. Local electric codes allow only one AC power cord to be connected to the system when using 208VAC or 240VAC as the primary AC power. BPSB240 conforms to the National Electric Code standards. If using 208VAC as primary power, the plug on the BPSB240 AC power cord that exits the cabinet (NEMA 6-20P) may have to be changed to a twist-lock type by a certified electrician to conform with local electric codes.
BACL240	AC208V or AC240VAC nine ft. power supply cord. The cord is rated at 10 amps. (max.) and must be used when the system is powered by 208VAC or 240VAC. One cord is required for each cabinet power supply and must be ordered separately only if using 208VAC or 240VAC as the system primary AC power. The cord is equipped with a 250VAC/20A plug (NEMA 6-20P) which is standard for 240VAC. If using 208VAC as the system primary power this cord may have to be changed by a certified electrician for one or two cabinet installations. If using three or more cabinets, a BPSB240 power strip is required and the power strip plug may have to be changed by a certified electrician depending on local electric codes.
PBTC-3M	A three-meter long battery cable is used to connect reserve power batteries to the system power supply when the system has less than three cabinets. One reserve power cable is required for each cabinet in a one or two cabinet system (wall or floor mount). The cable connects the Strata CTX670 cabinet power supply directly to the battery terminals (a BBDB is not required).

Table 2-66 CTX670 Power Cabinet Hardware *(continued)*

Option	Description
BBDB	Strata CTX reserve power battery distribution box is required when connecting reserve power batteries to three or more cabinets (wall or floor mount). The box is field installed into one of the Strata CTX cabinet side panels. The BBDB provides seven BBTC2A-2.0M, battery distribution cables to connect reserve power from the BDDB box to each individual cabinet power supply. One or two BBTC1A-2.0M must be ordered separately when using the BBDB battery distribution box.
BBTC1A-2.0M	A two-meter battery cable used to connect reserve power batteries to the BBDB battery distribution box. One reserve power cable is required in a three or four cabinet system and two cables are required for five, six or seven cabinet systems (wall or floor mount). The cable connects Strata CTX BBDB box directly to the battery terminals.
BCCB120 or BCCB240	Strata CTX conduit connection box is installed in the bottom cabinet, side panel. It is used to hardwire Primary AC power and reserve battery power connections through conduit. These boxes are required by UL for three or more floor mounted cabinets. Conduit boxes are not required for wall mounted systems with any number of cabinets or floor mounted system with one or two cabinets. They can be used as an option on any system. The BCCB120 is required when connecting AC120VAC as the primary power source and the BCCB240 is required when connecting AC208VAC or AC240VAC as the primary power source. BCCB conduit boxes must be field installed by a certified electrician.
BFIF	Floor mount fixture kit is required when floor mounting Strata CTX cabinets. Provides two metal stands for mounting any number of Strata CTX cabinets on the floor. Three pairs or wall brackets (RWBF) are supplied with BFIF to use when mounting three or more Strata CTX cabinets on floor. The wall brackets are needed to secure floor-mounted systems to the wall for safety purposes.

CTX670 Cabinet AC Power Component Requirements for Wall Mounted Systems

Tables 2-67 and 2-68 show the cabinet parts required to distribute AC power for various configurations of the Strata CTX cabinets.

Table 2-67 Wall Mount Cabinet Power Component Requirements for 120VAC Primary Power

Local Electrical Code	1 Cabinet	2 Cabinets	3 Cabinets	4 Cabinets	5 Cabinets	6 Cabinets	7 Cabinets
Allows only one 120VAC power cord from system	0 RPSB2	1 RPSB2	1 RPSB2	N/A	N/A	N/A	N/A
Allows two 120VAC power cords from system	0 RPSB2	0 RPSB2	1 RPSB2	1 RPSB2	2 RPSB2	N/A	N/A
• One dedicated, isolated, 20 amp. AC circuit breaker with dual outlets is required. • N/A= If the system contains more than three cabinets and if the local code allows only one AC cord, the system requires a BCCB120 conduit box wired by a certified electrician when using 120VAC as primary power. Otherwise, 208VAC or 240VAC should be used as the primary power source (see cabinet power options listed below). If more than five cabinets are installed, 208VAC or 240VAC is required.							

Table 2-68 Wall Mount Cabinet Power Component Requirements for 208VAC or 240VAC Primary Power

Local Electrical Code	1 Cabinet	2 Cabinets	3 Cabinets	4 Cabinets	5 Cabinets	6 Cabinets	7 Cabinets
Allows One AC power cord from system	1 BACL240	1 BPSB240 2 BACL240	1 BPSB240 3 BACL240	2 BPSB240 4 BACL240	2 BPSB240 5 BACL240	3 BPSB240 6 BACL240	3 BPSB240 7 BACL240

Important! *The plugs and wall receptacles required by the local electrical code might differ for 208VAC and 240VAC. Thus in some areas of the U.S., the plug used on the Toshiba 240VAC power strip and 240VAC power supply cord (NEMA code 6-20P) can not be used for 208VAC installations. In this case, when using 208VAC, the AC plugs on the BPSB240 power strip cord that connects directly to the 208VAC wall outlet must be changed by a certified electrician per the local electrical code.*

Cabinet AC Power Component Installation

After the cabinets have been floor mounted, the AC power components should be installed Tables 2-69 and 2-70 show the primary AC power components required for floor mounted systems.

Table 2-69 Floor Mount Cabinet Component Requirements for 120VAC Primary Power

Local Electrical Code	1 Cabinet	2 Cabinets	3 Cabinets	4 Cabinets	5 Cabinets	6 Cabinets	7 Cabinets
3 or more cabinets require a conduit box	1 – BFIF	1 – BFIF	1 -BCCB120[1] 1 – BFIF	1 – BCCB120[1] 1 – RPSB2 1 – BFIF	1 – BCCB120[1] 2 – RPSB2 1 – BFIF	1 – BCCB120[1] 2 – RPSB2 1 – BFIF	N/A

1. A BCCB120 conduit connection box must be installed and wired by a certified electrician per the local electrical code.

Table 2-70 Floor Mount Cabinet Component Requirements for 208VAC or 240VAC Primary Power

Local Electrical Code	1 Cabinet	2 Cabinets	3 Cabinets	4 Cabinets	5 Cabinets	6 Cabinets	7 Cabinets
3 or more cabinets require a conduit box	1 – BACL240 1 – BFIF	1 – BCCB240[1] 2 – BACL240 1 – BFIF	1 – BCCB240[1] 1 – BPSB240 3 – BACL240 1 – BFIF	1 – BCCB240[1] 1 – BPSB240 4 – BACL240 1 – BFIF	1 – BCCB240[1] 2 – BPSB240 5 – BACL240 1 – BFIF	1 – BCCB240[1] 2 – BPSB240 6 – BACL240 1 – BFIF	1 – BCCB240[1] 3 – BPSB240 7 – BACL240 1 – BFIF

1. A BCCB240 conduit connection box must be installed and wired by a certified electrician per the local electrical code.

Worksheet 9 – Software Licenses

Enter the quantity of software license(s) required for your hardware configuration using the following worksheet.

Part Number	Strata CTX Software Licenses	Comments	Qty
LIC100-4 PORTS	4-port Line/Station License for CTX100.	Required for every 4 ports used for trunks or stations beyond the 32 ports bundled with the CTX100 processor (maximum total of 112 ports).	
LIC670-4 PORTS	4-port Line/Station License for CTX670.	Required for every 4 ports used for trunks or stations beyond the 64 ports bundled with the CTX670 processor (maximum total of 672 ports).	
LIC100-4 DTMF	4-port DTMF Receiver License for CTX100 Ports 5~16 and above.	Required for activation of 4 DTMF receiver ports number 5 and above on CTX100 system. Maximum 16 DTMF receiver ports per system. ARCS required.	
LIC670-4 DTMF	4-port DTMF Receiver License for CTX670 Ports 9~32 and above.	Required for activation of 4 DTMF receiver ports – number 5 and above on CTX670 system. Maximum 32 DTMF receiver ports per system.	
LIC100-SER PORT	BSIS RS-232 serial port interface for SMDI or Toshiba Proprietary Voice Mail (VM) interface, Call Accounting SMDR and future applications.	One circuit does not require a license, but circuits 2~4 each require one LIC100-SER PORT license.	
LIC670-SER PORT	BSIS RS-232 serial port interface for SMDI or Toshiba Proprietary VM interface, Call Accounting SMDR and future applications.	One circuit does not require a license, but circuits 2~4 each require one LIC670-SER PORT license.	
LIC100-QSIG NET	Strata Net QSIG Networking Application License.	One required per system to network multiple CTX100 systems using Strata Net QSIG networking features.	
LIC670-QSIG NET	Strata Net QSIG Networking Application License.	One required per system to network multiple CTX670 systems using Strata Net QSIG networking features.	
LIC SOFTDKT-1	Toshiba SoftDKT™	Licensing on the CTX will allow the concurrent connection of as many clients as you want, provided that each client has a license).	
SOFTDKT-LIC-PKG	SoftDKT license and CD-ROM	The license and CD-ROM can be purchased as a bundle.	

Hardware Compatibility

PCB compatibility for the Strata DK424, DK424i, CTX100 and CTX670 systems is shown in Table 2-71.4.

Table 2-71 Hardware Compatibility

Category	Unit Name	DK280 & DK424	DK424i	CTX100	CTX670
Processor Card	BCTU/BEXU	NC	NC	NC	X
	BECU/BBCU with optional BBMS, BEXS, BSIS	NC	NC[1]	NC	X
	B_CAU/B_CBU cards for DK424i	NC	X	NC	NC
	RCTU cards for DK424	X	NC	NC	NC
	ACTU1, 2A-S and subassemblies	NC	NC	X	NC
DTMF Receiver Unit	BRCS-4/8/12	X	X	NC	NC
	RRCS-4/8/12	X	NC	NC	NC
	ARCS (16)	NC	NC	Used for ACTU1. Built-in ACTU2.	16/32 Built-in
Optional Interface Unit	BIOU	NC	NC	X	X
	BSIS	NC	NC	X	X
	PIOU, PIOUS, RSIU, RSIS	X	X	NC	NC
	RSSU	X	X	NC	NC
Standard Telephone Interface	BSTU, RSTU3, RDSU/RSTS	X	X	X	X
	ASTU (R1.3 and higher)	NC	NC	X	NC
Electronic Telephone Interface	PEKU, PESU	X	X	NC	NC
Digital Telephone Interface	ADKU	NC	NC	X	NC
	BDKU	X	X	X	X
	BWDKU1A	X[2]	X	X	X
	BDKS	NC	NC	X	X
	BPCI	NC	NC	X	X
	PDKU2 (DKT2000-series phones only)	X	X	X	X
	RDSU, RSTS (DKT2000-series only)	X	X	X	X
IP Telephone Interface	BIPU-M2A, BIPU-M1A[3]	NC	NC	X	X
CO Line Interface	BVPU	X	X	X	X
	RCIU/RCIS	X	X	X	X
	RCMU/RCMS	X	X	X	X
	RCOU/RCOS[4]	X	X	X	X
	RDDU	X	X	X	X
	RDTU2, 3	X	X	X	X
	REMU	X	X	X	X
	RGLU2, RGLU3	X	X	X	X
ISDN Interface	RBSU/RBSS	X[2]	X	X	X
	RBUU/RBUS	X[2]	X	X	X
	BPTU1, RPTU2, RPTU	X[5]	X	X	X[6]
Remote Expansion Cabinet Interface	RRCU	X	X	NC	X
Strata Net over IP-QSIG Interface	BIPU-Q1A[3]	NC	NC	X	X[4]

Table 2-71 Hardware Compatibility *(continued)*

Category	Unit Name	DK280 & DK424	DK424i	CTX100	CTX670
Stations and Terminal Equipment	EKT2000, EKT6000, EKT6500, HDSS, HDCB	X	X	NC	NC
	Existing Proprietary Attendant Console	X	X	NC	NC
	DK424 PC Attendant	X	X	NC	NC
	Strata CTX PC Attendant Console, BATI	NC	NC	X	X
	RPCI (RS-232C) - Data or TAPI	X	X	NC	NC
Stations and Terminal Equipment	BPCI (RS-232C) - Data or Voice Record TAPI	NC	NC	X	X
	DKT1000[7]	X	X	X	X
	DKT2000	X	X	X	X
	DKT3000	X[8]	X[8]	X	X
	IPT1020-SD	NC	NC	X	X
Ethernet LAN	AETS	NC	NC	Used for ACTU1. Built-in ACTU2.	Built-in
V.34 Admin Modem	AMDS	NC	NC	X	Built-in
Base Cabinet	DKSUB424 or DKSUB280	X	NC	NC	NC
	CHSUB672	NC	X	NC	X
	CHSUB112	NC	NC	X	NC
Expansion Cabinet	DKSUE424	X	NC	NC	NC
	CHSUE672	NC	X	NC	X
	CHSUE112	NC	NC	X	NC
	Data Cable for Strata DK424 Expansion Cabinet	X	NC	NC	NC
	Data Cable for CTX670 Expansion Cabinet	NC	X	NC	X
	Data Cable for CTX100 Expansion Cabinet	NC	NC	X	NC
Power Supply Unit	RPSU424 (120VAC)	X	NC	NC	NC
	BPSU672 (120VAC/208VAC/240VAC power supply)	NC	X	NC	X
	APSU112 (120VAC)	NC	NC	X	NC
Conduit Connection Box	RCCB2	X	NC	NC	NC
	BCCB120 (120V box)	NC	X	NC	X
	BCCB240 (240V box)	NC	X	NC	X
Battery Distribution Box	RBDB2	X	NC	NC	NC
	BBDB1 (new Battery Dist. Box, 7 BBTC2A-2.0M)	X	X	NC	X
Power Strip	RPSB1 (120VAC power strip)	X	NC	NC	NC
	RPSB2 (120VAC power strip)	X	X	NC	X
	BPSB240 (240VAC power strip)	NC	NC	NC	X
Battery Cable	PBTC-3M	X	X	NC	X
	BBTC1A-2.0M	NC	X	NC	X
	ABTC-3M	NC	NC	X	NC
Battery Charger	ABCS1	Built-in	Built-in	X	Built-in

X = Compatible NC = Not Compatible

1. If the BCTU, BEXU or BECU/BBCU replaces the DK424i processors, then the system is upgraded to a CTX670.
2. Jumper plugs on the BWDKU1A determine 8 or 16 DKT circuits and CTX or DK compatibility.
3. If a BIPU-M or BIPU-Q is installed RCOU1A, RCOS1A RDDU1A, RGLU1A, RGLU2A, and two-wire REMU cards should not be installed to avoid excessive Echo Return Loss (ERL).
4. The RCOS1A cannot be installed on the RCOU3A. The RCOS3 can be installed on the RCOU1A.
5. Requires Release 4.x software.
6. BPTU1, RPTU2, or BIPU-Q1A is required for QSIG Networking.
7. DKT1000-series telephones do not support continuous DTMF tones.
8. Functions as a DKT2000.

Strata CTX100-S/CTX100 Installation 3

This chapter explains how to install the Strata CTX100-S/CTX100 systems. It includes information on site requirements, wiring diagrams, and step-by-step instructions on how to install the unit(s), the ground wiring, AC power cabling, reserve power (battery backup) cabling, and PCB cabling.

Inspection

1. When the system is received, examine all packages carefully and note any visible damage. If any damage is found, do not open the packages. Contact the delivery carrier immediately and make the proper claims.
2. After unpacking (and before installing), check the system against the packing list and inspect all equipment for damage. If equipment is missing or damaged, contact your supplier immediately.
3. Be sure to retain original packaging materials for re-use when storing or transporting system hardware.

Packaging and Storage

CAUTION! **When handling (installing, removing, examining) PCBs, do not touch the back (soldered) side or edge connector. Always hold the PCB by its edges.**

➤ When packaging and storing the system, remove PCBs from the system cabinet (the power supply may remain installed in the cabinet for storage and shipment). PCBs should be packaged in their original antistatic bags for protection against electrostatic discharge. Be sure to package equipment in its original shipping containers.

Site Requirements

This section defines the installation site requirements necessary to ensure a proper operating environment for the CTX100. Also included are grounding requirements.

Input Power

The Base Cabinet or the Base and Expansion Cabinet together require an input power source of 120VAC, 60 Hz, 15 amps. Each cabinet plugs into an AC power outlet. Each cabinet requires 1.8 amps AC from the power source or 3.6 amps AC combined. The power supply cord for each cabinet is 4.5 ft. long with a standard three-prong 120VAC plug.

The AC outlet is recommended to be dedicated and unswitched, with a solid third-wire ground. (See “AC Power and Grounding Requirements” on page 3-4.) This eliminates interference from branch circuit motor noise or the like, and to prevent accidental power-off. To avoid accidental power turn-off, Toshiba recommends that you do *not* use an On/Off wall switch on this dedicated AC circuit.

For the Strata CTX100, a reserve power source (two or four customer-supplied 12VDC batteries) may be connected to the system to serve as a power failure backup.

Cabinet Size and Weight

The wall that will support the CTX100 should be able to support 35 lbs. The weight of each cabinet is shown in Table 2-1 on page 2-2.

Clearance and Location

The minimum clearance requirements for the Strata CTX100 Base and Expansion cabinets are shown in Figure 3-1.

Consider the following conditions when selecting a location for the Cabinet(s):

The location *must be*:

- Dry and clean
- Well ventilated
- Well illuminated
- Easily accessible

The location *must not be*:

- Subject to extreme heat or cold
- Subject to corrosive fumes, dust, or other airborne contaminants
- Subject to excessive vibration
- Next to television, radio, office automation, or high frequency equipment

If reserve power is to be installed for the Strata CTX100, the batteries will require a well-ventilated location close (within nine feet) to the CTX100 (the optional Toshiba-supplied battery cable is nine feet in length).

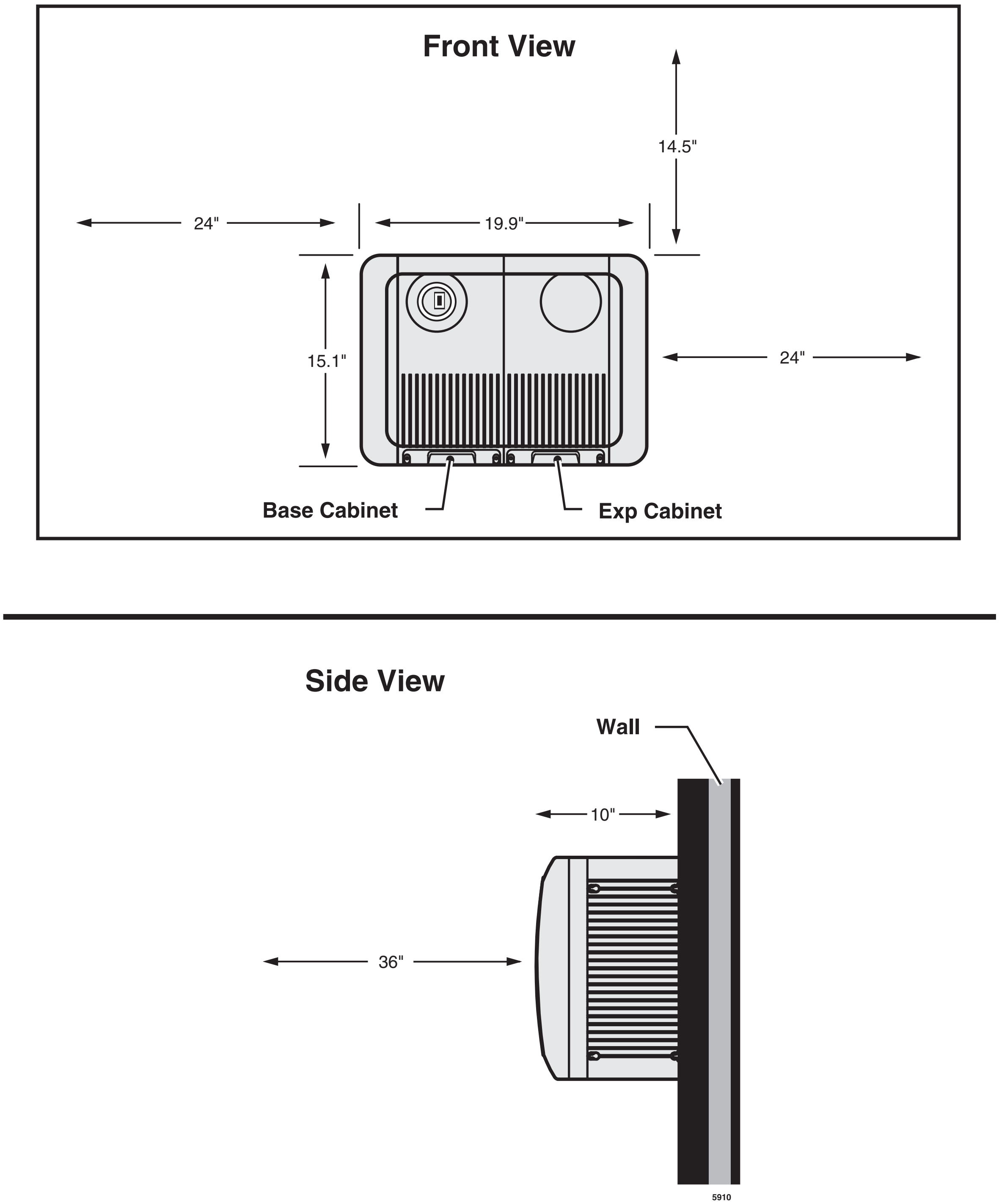


Figure 3-1 CTX100 Base Cabinets and Expansion Clearance Requirements

Environmental Considerations

Table 3-1 provides a summary of the environmental characteristics.

Table 3-1 CTX100 Environmental Characteristics

Environmental Specifications	
Operating temperature Operating humidity Storage temperature	32~104° F (0~40° C) 20~80% relative humidity without condensation -4~140° F (-20~60° C)
BTU Rating (Base plus Expansion Cabinet)	
ACTU (installed) BDKU (5 installed) RCOU/RCOS (1 installed) Digital Telephones (40 installed)	190 Watts (56 watt hours for both cabinets)

AC Power and Grounding Requirements

The CTX100 requires a solid earth ground for proper operation. The five ft. AC power cord contains a conductor for the "third-wire ground" provided by the commercial power outlet. The third-wire ground should be the only ground necessary for each CTX100 cabinet; this ground must originate at the building's main power distribution panel and have a solid connection to earth ground. (See Figure 3-2.)

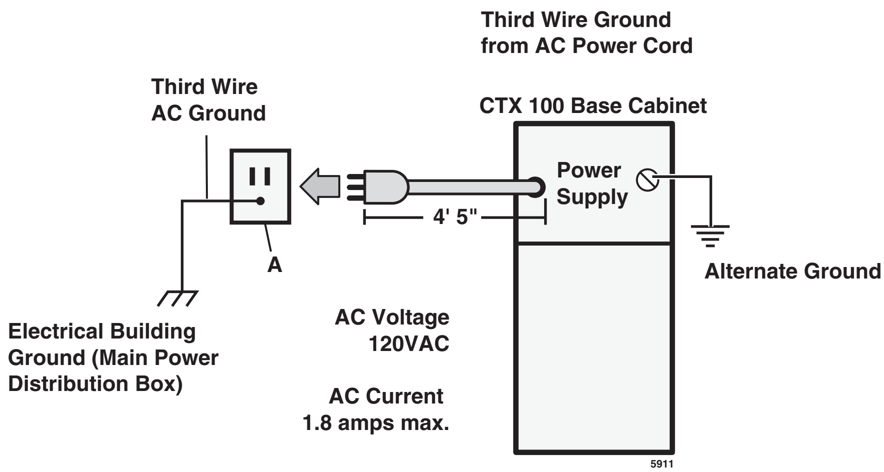


Figure 3-2 CTX100 Grounding Diagram

CAUTION! Lack of proper ground may cause improper operation and, in extreme cases, system failure.

An inter-cabinet ground wire connecting the Base and Expansion cabinets is not necessary.

Power Considerations

The power supply in each Strata CTX100 Base and Expansion Cabinet furnishes power to all of the PCBs and stations and some of the interface peripherals. The primary AC power for each cabinet is 120VAC (see Table 2-59 on page 2-47).

AC Power and Third-wire Ground Test

Test the "third-wire ground" for continuity by either measuring the resistance between the third prong terminal (earth ground) and a metal cold water pipe (maximum: 1 ohm), or by using a commercially available earth ground indicator. If neither procedure is possible, perform the following earth ground test procedure.

WARNING! Hazardous voltages that may cause death or injury are exposed during the following test. Use great care when working with AC power line voltage.

➤ **To perform the earth ground test procedure**

1. Obtain a suitable voltmeter, and set it for a possible reading of up to 250VAC.
2. Connect the meter probes between the two main AC voltage terminals (white and black wires) on the wall outlet. The reading obtained should be between 100~125VAC.
3. Move one of the meter probes to the third terminal (green wire ground). Either the same reading or a reading of zero volts should be obtained.
4. If the reading is zero volts, leave one probe on the ground terminal and move the other probe to the second voltage terminal.

CAUTION! If a reading of zero volts is obtained on both voltage terminals (white wire to green wire, black wire to green wire), the outlet is not properly grounded. Omit Steps 5 and 6, and see following CAUTION!

5. If a reading of zero volts on one terminal, and a reading of 100~125VAC on the other terminal is obtained, remove both probes from the outlet.
6. Set the meter to the "OHMS/Rx1" scale. Place one probe on the ground terminal, and the other probe on the terminal that produced a reading of zero volts. The reading should be less than 1 ohm.

CAUTION! If the reading is more than one ohm, then the outlet is not adequately grounded. If the above tests show the outlet AC voltage is not in range or is not properly grounded, the condition should be corrected (per Article 250 of the National Electrical Code) by a qualified electrician before the system is connected.

Alternate or Additional Ground

If the "third-wire" AC ground can not practically be improved or if extreme motor noise or other disturbance causes system malfunction, or if local area lightning storms exist, a separate direct ground may be warranted.

Connect an alternate earth ground from a cold water pipe or earth grounding rod directly to the screw terminal on the CTX100 power supply (see Figure 3-2).

Installing the CTX100 Cabinet

Step 1: Remove Cabinet Covers

WARNING!	**Ensure the power supply AC plug is not plugged into the AC outlet.**

1. Loosen the screws from the front cover to remove it.
2. Loosen the four screws from the top cover and slide it off.
3. Loosen the four screws from each side cover and pull the covers forward to remove them.

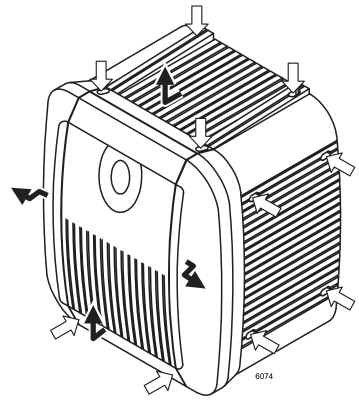


Figure 3-3 Cabinet Cover Removal

Step 10: Remove the Back Cover from the Cabinet(s)

1. Remove and save the two screws from the back of the Base Unit.
2. Slide the metal cover about a half inch to the right (it will drop down and forward) to remove it.
3. If you are installing an Expansion Cabinet, remove one screw from the back of the Expansion Cabinet. Slide the metal cover to the right to remove it.

Note The figure below show the position of the screws. Back covers should be removed before the Base and Expansion cabinets are attached to each other.

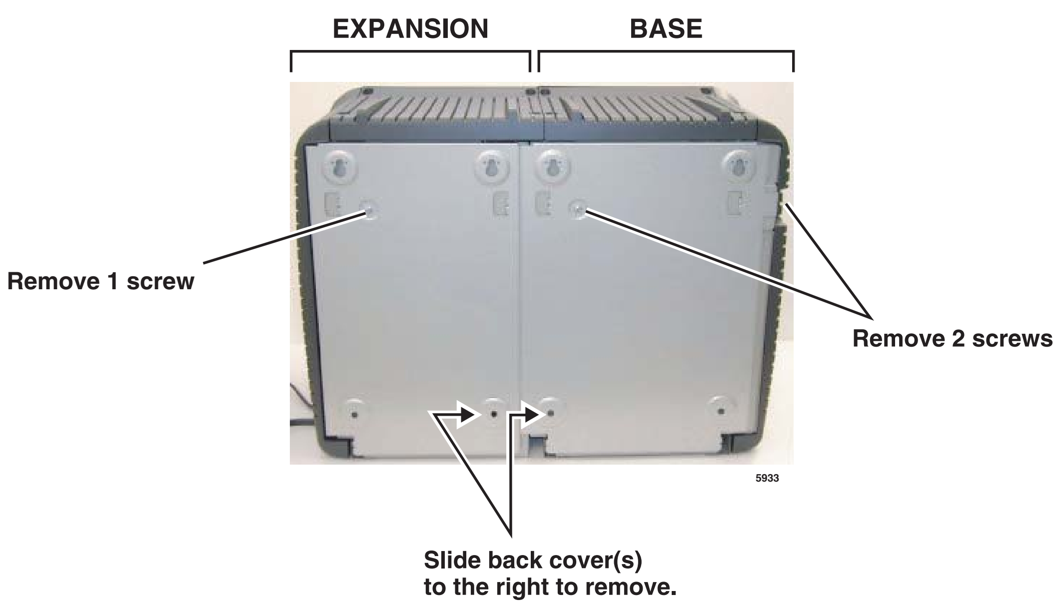


Figure 3-4 Base and Expansion Cabinet Back Covers

Step 11: Check the Base/Expansion Power Supply Jumper Plug

The APSU112A power supply is used in both CTX100 cabinets.

➤ Check that the “BASE/EXP.” jumper plug is connected to the proper power supply connector as shown in Figure 3-14. The power supply has two connectors: one is labeled “BASE” and the other “EXP.”

- If the power supply is mounted in the CTX100 Base Cabinet, the “BASE/EXP.” jumper plug must be plugged into the “BASE” connector.
- If the power supply is mounted in the CTX100 Expansion cabinet, the jumper plug must be plugged into the “EXP.” connector.

Step 12: Mount the Base Cabinet

WARNING! **To prevent electrical shock, make sure the power supply is not plugged into the AC outlet.**

1. Make sure the location of the Base Cabinet meets the minimum clearance requirements specified in Figure 3-1 on page 3-3.

Note The Base Cabinet AC power cord is four feet, five inches long.

2. Attach a 1/2” thick plywood back board to the wall where the CTX100 will be installed. Secure the back board to the wall with screws attached to the wall studs, shown in Figure 3-5.
3. Place the Base Cabinet back cover at the desired location on the back board using a level and mark the location of the four screw holes (there is one on each corner).
4. Drill holes on these marks.
5. Secure the top two screws approximately two thirds of the way into the top two holes on the back board.
6. Hang the Base Cabinet back cover from the top two screws and then secure the top and bottom screws completely into the back board. The base back cover should now be tightly secured to the back board. See Figure 3-5.
7. To mount the Base Cabinet, position the cabinet hanger holes onto back cover hangers (two on top and two on the bottom as shown in Figure 3-6). Slide the cabinet to the left.
8. Secure the Base Cabinet to the back cover with a screw through the left side bracket of the back cover to the Base Cabinet. (See Screw “A” in Figure 3-5.)
9. If you are installing an Expansion Cabinet, go to “Step 13: Mount the Expansion Cabinet (if required)” on page 3-9. Follow the steps, then return to these steps.
10. Ground the system according to “AC Power and Grounding Requirements” on page 3-4.
11. Go to “Step 16: Set Jumpers and Install Option PCBs onto the ACTU” on page 3-20.

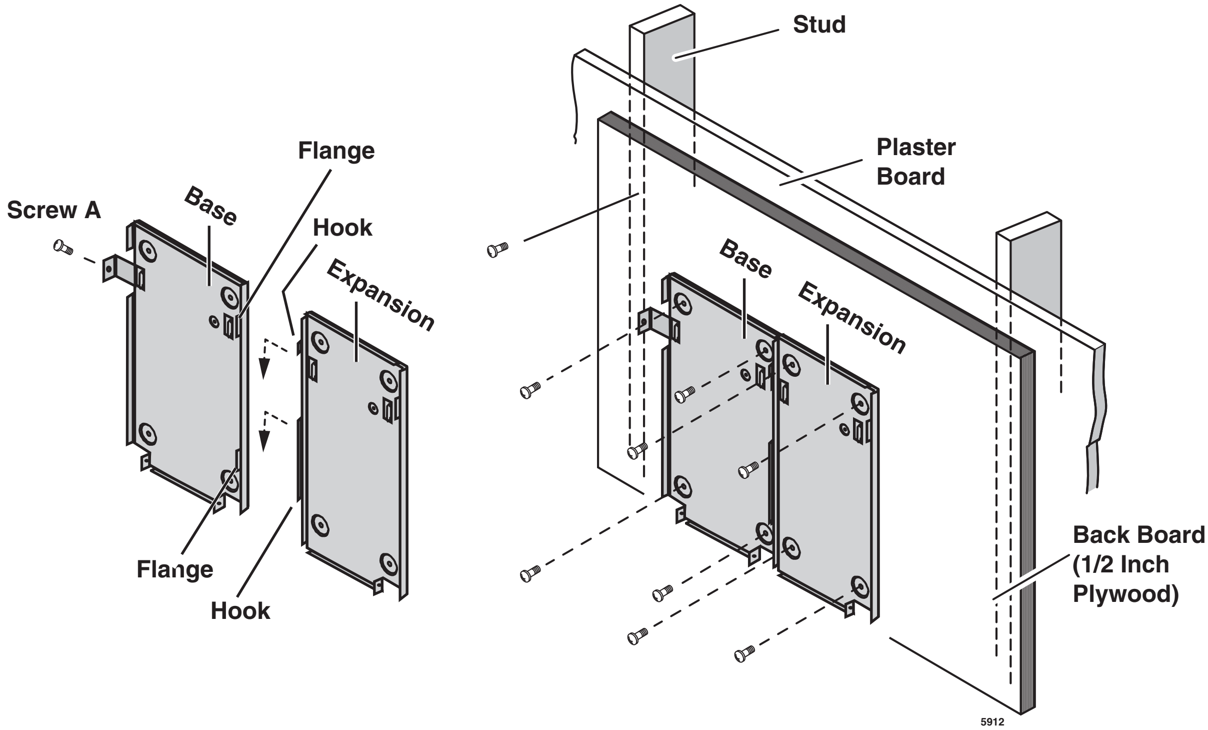


Figure 3-5 Cabinet Wall Mounting

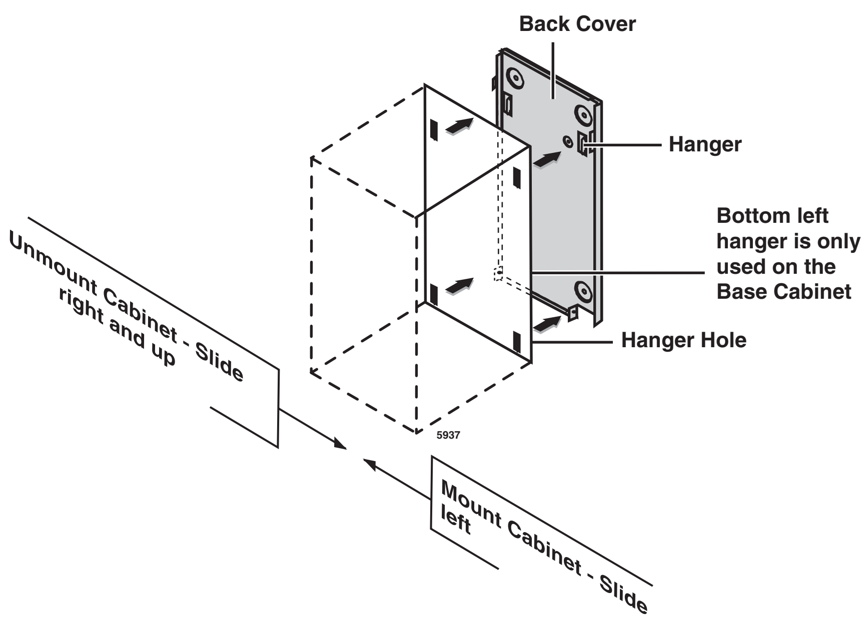


Figure 3-6 Mounting CTX100 Cabinet on Back Cover

Step 13: Mount the Expansion Cabinet (if required)

WARNING! To prevent electrical shock, make sure the power supply is not plugged into the AC outlet.

1. Turn Base Cabinet DC power switch Off. Remove the four screws on the right side cover of the Base Cabinet.
2. Remove four screws from the right side of the Base Cabinet (since they will interfere with attaching the Expansion Cabinet to the Base Cabinet later).
3. Remove the Expansion Cabinet back cover from the Expansion Cabinet (see Figure 3-4).
4. Place the Expansion Cabinet back cover next to the Base Cabinet back cover, making sure expansion back cover hooks fit into the base back cover flanges (see Figure 3-5).
5. Mark the location of the four screw holes – there is one on each corner.

   Make sure the location of the Expansion Cabinet meets the minimum clearance requirements specified in Figure 3-1 on page 3-3.
6. Drill holes on these marks.
7. Place the Expansion Cabinet back cover on the wall back board and secure the back cover to the back board with four screws.
8. On the right side of the AMAU motherboard inside the Base Cabinet, flip open the top and bottom locks for data ribbon cable plug. Plug in the data ribbon and close the locks. Feed the ribbon through the side hole of the Base Cabinet.
9. To mount the Expansion Cabinet, position it onto the back cover hangers.

Note Position the cabinet over the bottom right hanger first, and then carefully tilt the cover over the top two hangers.

10. Slide the Expansion Cabinet to the left, feeding the data ribbon cable through the side hole of the Expansion Cabinet.
11. Finish by securing the Expansion Cabinet to the Base cabinet with the two screws in front of the cabinets where they join together. The expansion cabinet left-side flange fits over the Base cabinet right side flange (see Figure 3-7).
12. On the AMAU motherboard of the Expansion Cabinet, flip open the two data ribbon locks, plug in the data ribbon and close the locks. The data ribbon cable should now be connected to the Base and Expansion cabinets.
13. Install PCBs into the Expansion Cabinet; follow the instructions in "Step 18: Install Other PCBs into the Cabinet(s)".

Note The Base Cabinet DC power switch will be the master control for turning the DC power of both cabinets On/Off.

14. Attach the outside covers on the Expansion Cabinet.

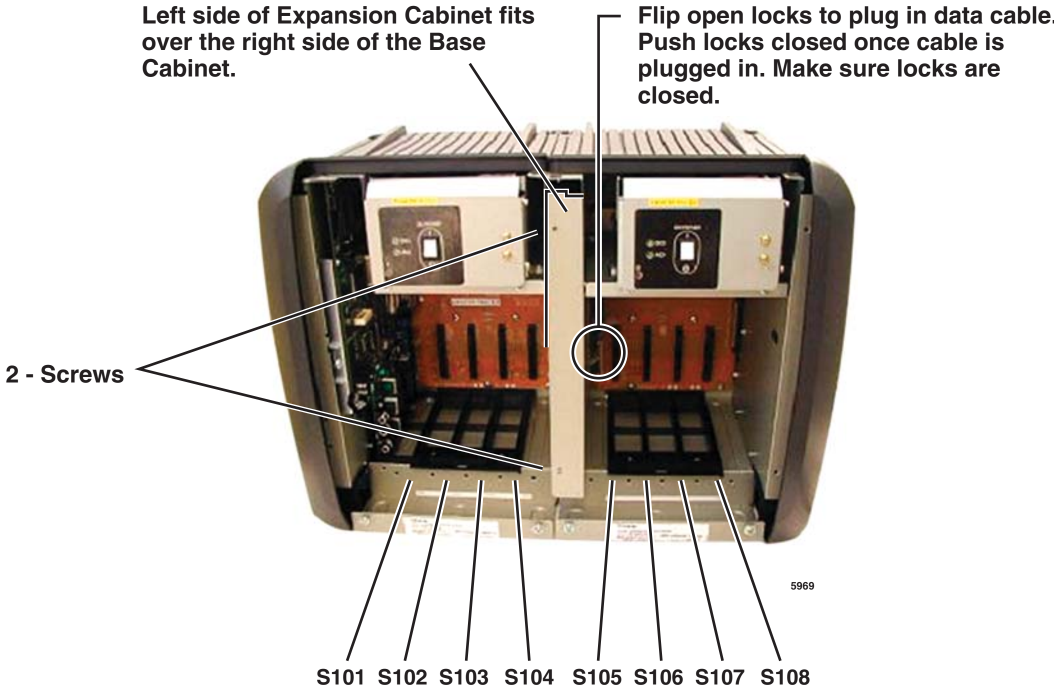


Figure 3-7 Base and Expansion Cabinet Interior

Step 14: Install Reserve Power

Skip this step if you are not going to install reserve power batteries.

A reserve power source (two or four customer supplied 12VDC batteries) can be connected to the CTX100 power supply equipped with an ABCS battery charger to ensure uninterrupted system operation in the event of a power failure. The ABCS battery charger and a pre-assembled battery cable (ABTC-3M) for connecting the batteries is available from Toshiba (see Figure 3-8).

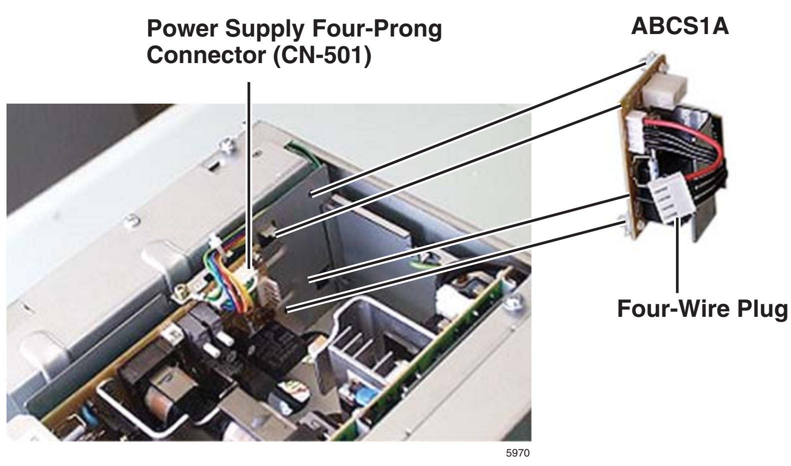


Figure 3-8 CTX100 Power Supply (Top view)

Reserve Battery Considerations

Important! *Local ordinances may dictate battery type and installation details.*

The batteries require a well-ventilated location within nine feet of the system (the interface cable is nine feet long).

WARNING! To reduce the risk of fire or injury to persons, read and follow these instructions:

- **Use only 12VDC gelcell batteries.**
- **Do not dispose of the batteries in a fire. The cells may explode. Check with local codes for possible special disposal instructions.**
- **Do not open or mutilate the batteries. Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.**
- **Exercise care in handling batteries in order not to short the battery with conduction materials such as rings, bracelets, and keys. The battery or conductor may overheat and cause burns.**
- **Charge the batteries provided with or identified for use with this product only in accordance with the instructions and limitations specified in this manual.**
- **Observe proper polarity orientation between the batteries and battery charger.**

Step 6A: Install the Optional ABCS1A Battery Charger

WARNING! Whenever the cabinet top cover is removed, use extreme caution. Do not touch any internal power supply components because hazardous voltages may be exposed. Whenever adding/removing power supply components or checking circuit breakers and fuses, unplug the power supply AC plug from the AC source outlet.

1. Attach the ABCS1A to the inside wall of the Power Supply (see photos below). Fit the two holes on the ABCS1A over the metal prongs of the power supply and align the two plastic tips of the ABCS1A over the holes on the inside wall of the power supply. Snap the ABCS1A into place. Pull on the ABCS1A to make sure that it’s securely installed.
2. Attach the ABCS1A four-wire plug onto the power supply four-prong connector (CN-501).

Step 6B: Install the Battery Cable

1. A black jumper wire is supplied with the ABTC-3M cable. Connect the black jumper wire from the positive terminal of one 12VDC battery to the negative terminal of the second 12VDC battery (see Figure 3-9).
2. Ensure that a serviceable 10-amp fuse is installed in the in-line fuse holder of the ABTC-3M battery cable.
3. Connect the white lead of the ABTC-3M battery cable to the open positive terminal of the 12VDC battery. Connect the black lead to the open negative terminal of the second 12VDC battery.

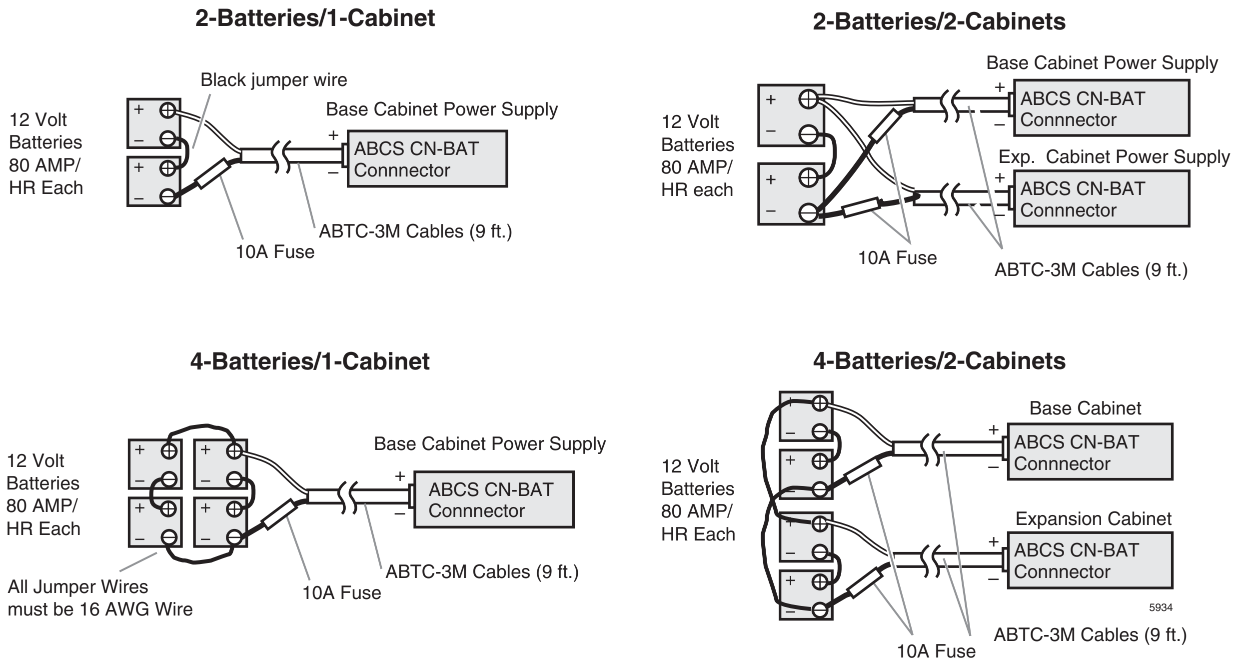


Figure 3-9 Battery Wiring Diagram

4. Run the ABTC-3M battery cable from the batteries to the ABCS battery charger located in the CTX100 power supply. Dress the battery cable within the CTX100 cabinet(s) carefully (see Figures 3-10~3-13).

Important! *The CTX100 must be connected to the live operating (hot) AC power source, and the power supply On/Off switch set to On prior to the final step of connecting the reserve power battery cable to the ABCS battery charger. If the batteries are connected after AC power is lost, reserve power will not function.*

5. Connect the ABTC-3M battery cable two-prong female plug to the power supply "CN-BAT" receptacle on the ABCS charger.
6. To test reserve power operation, disconnect the system AC power plug from the source outlet while the power supply power On/Off switch in the On position. The AC and DC power lights should be Off. The system should continue to operate without interruption or dropped calls.
7. Plug the AC power cable back into the outlet; make sure the power supply switch is On.

8. Confirm that the power supply is working properly. (AC Power lights should be On.)

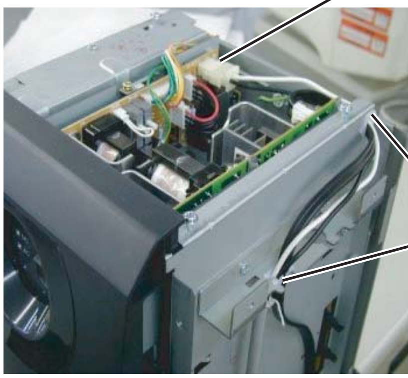


Figure 3-10 Cable Wiring for the Base and Expansion Cabinets (Top view)

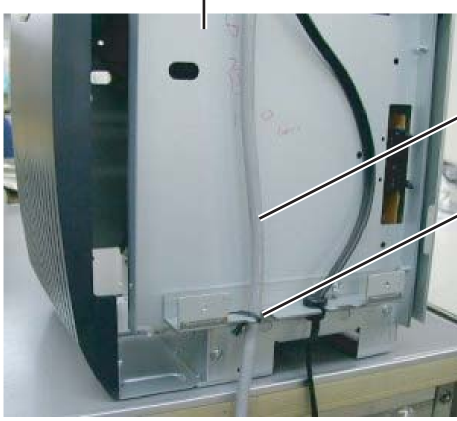


Figure 3-11 Cable Wiring for a Base Cabinet Only (Side view)

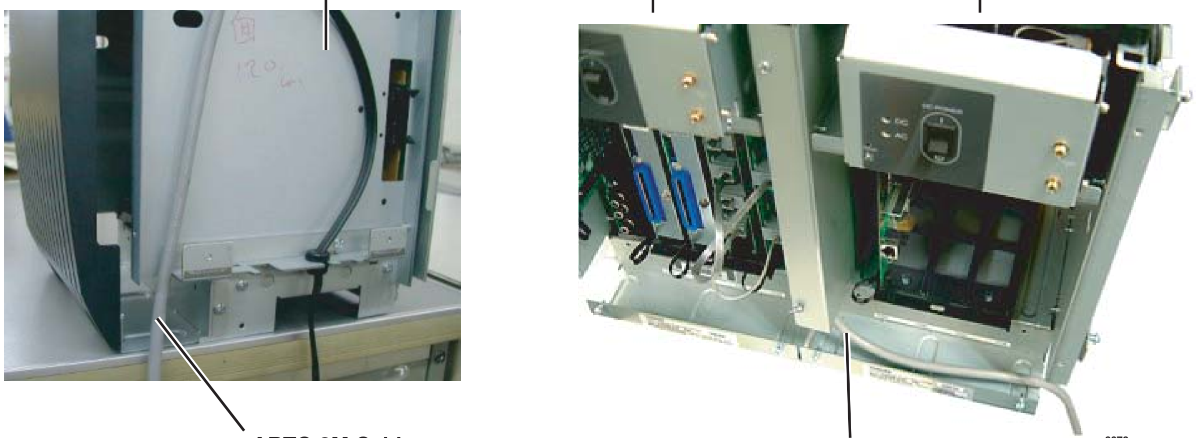


Figure 3-12 Cable Wiring for the Base with an Expansion Cabinet

Figure 3-13 Cable Wiring for the Expansion Cabinet (Side view)

Step 15: Check Power Supply Circuit Breakers and Fuses

This step is only needed if you experience problems with the system.

WARNING! **Whenever the cabinet top cover is removed, use extreme caution. Do not touch any internal power supply components because hazardous voltages may be exposed. Whenever adding/removing power supply components or checking circuit breakers and fuses, unplug the power supply AC plug from the AC source outlet.**

Step 7A: Check the -24 Volt Circuit Breakers

The APSU112 provides two -24v circuit breakers as shown in Figure 3-14. If a low resistance between –24 volts and ground exists the circuit breaker will trip. Usually the front panel DC green LED indicator will turn off but not always. Also if AC power is recycled the DC LED indicator may turn back on – even if the –24 volt circuit breaker is tripped.

Circuit Breaker Location and Slot Assignments (see Figure 3-14)

- The circuit breaker V1, located directly below the FG screw, protects the first and second cabinet slots.
- The circuit breaker V2, located next to the BASE jumper connector, protects the third and fourth cabinet slots.

Reset Circuit Breaker

1. A defective PCB or an external short on the MDF may cause the circuit breaker to trip.
2. If you suspect that a –24 volt circuit breaker has tripped, try to reset it by:
    - Turn the power supply DC power switch off and unplug the power supply AC power cord from the AC outlet – the inside of the power supply has exposed voltages.
    - Gently press in each circuit breaker and listen for or try to feel it click. If the breaker was tripped, you will hear or feel it click back to the set position.
    - If the circuit breaker resets, pull the PCBs and check for MDF shorts associated with the slots assigned to the tripped circuit breaker. Remove any defective PCBs and MDF shorts.
    - Restore power and verify the system is working normally.
3. Replace the power supply if the circuit breaker continues to trip and a defective PCB or short cannot be found. See “Step 7D: Remove and Replace the Power Supply (if required)” on page 3-17.

Step 7B: Check the AC Power Fuses

The APSU112 provides two AC power fuse as shown in Figure 3-14. If low resistance to ground exists the fuse may blow. The front panel AC green LED indicator will turn off.

If you suspect that a AC fuse has blown you may check it by:

1. Turn the power supply DC power switch off and unplug the power supply AC power cord from the AC outlet – the inside of the power supply has exposed voltages.
2. Remove each fuse and check that it is less than 0.3 ohms. Replace the fuse if it is defective. The fuse size is T6.3AH 250V.
3. If you replace the fuse and it continues to blow, pull the PCBs and check for cabinet shorts. Remove any defective PCBs and cabinet shorts.

4. Replace the power supply if the fuse continues to blow and a defective PCB or short cannot be found. See “Step 7D: Remove and Replace the Power Supply (if required)” on page 3-17.

Step 7C: Check the Power Factor Indicator and Reset Button

The front panel of APSU112 provides a Power Factor LED and Reset button. If the cabinet power factor is exceeded by overload of PCBs, the PF LED will turn on.

➤ If the PF LED indicator turns on, press the PF reset button with a pointed tool or pencil. If the PF LED turns off and does not turn on again it may have been turned on by a current surge while installing a PCB while the power supply was turned-on.

➤ When a PF alarm is indicated, check that the cabinet power factor is not exceeded using “Worksheet 7 – System Power Factor Check” on page 2-42. If the Power factor has been exceeded relocate any PCBs that are causing the PF to be exceeded.

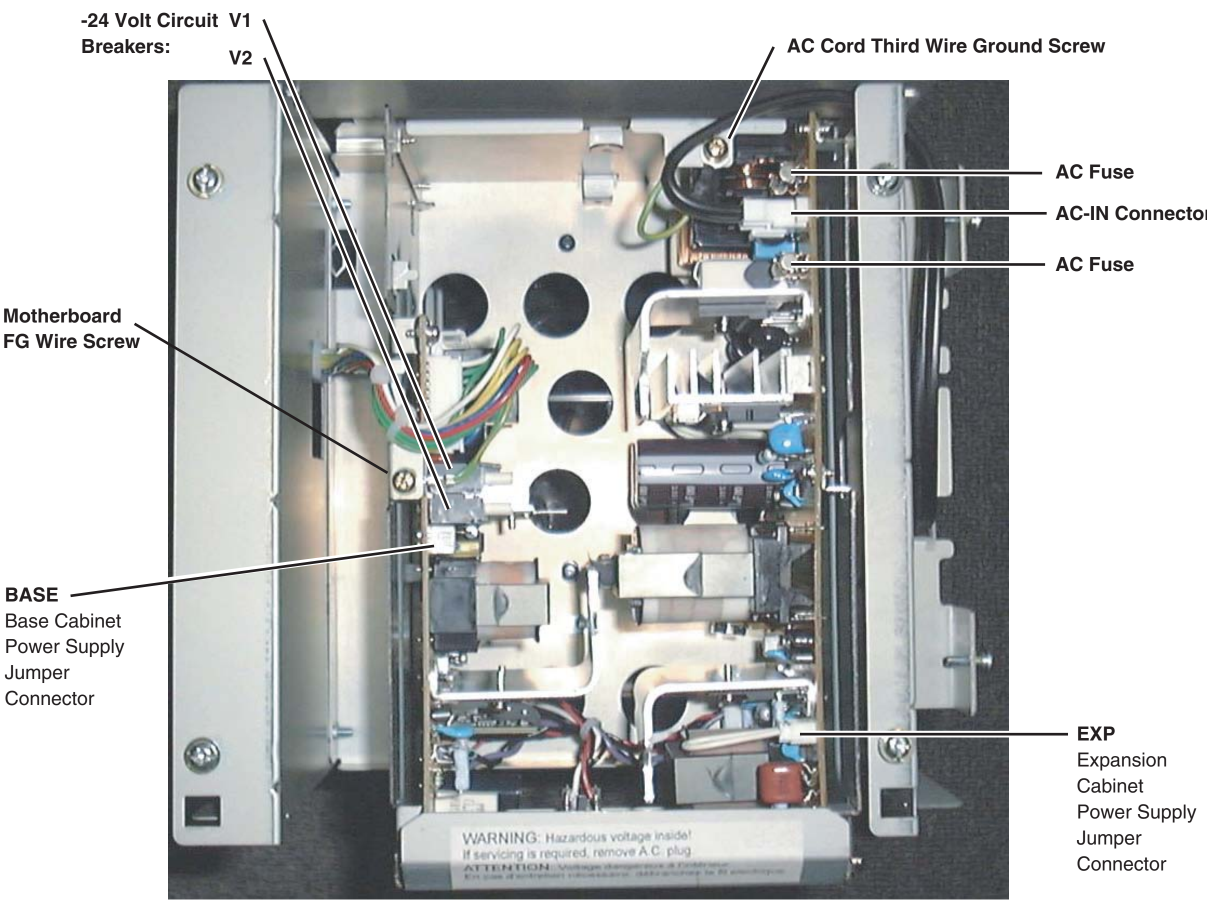


Figure 3-14 Power Supply Connectors Top View

Step 7D: Remove and Replace the Power Supply (if required)

The power supply (APSU112) comes factory-installed in the Base and Expansion Cabinets; if necessary, it can be removed and replaced. If you do not need to replace the power supply, skip this step.

Removing the Power Supply

WARNING!	**Whenever the cabinet top cover is removed, use extreme caution. Do not touch any internal power supply components because hazardous voltages may be exposed. Whenever adding/removing power supply components or checking circuit breakers and fuses, unplug the power supply AC plug from the AC source outlet.**

1. Make sure that the power supply switch is Off and that the AC power cable is not plugged into an outlet. Confirm that the green AC LED is not lit (see Figure 3-15).
2. Remove the two screws in front of the Power Supply (see Figure 3-15).

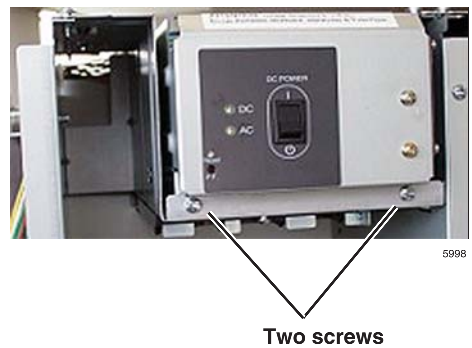


Figure 3-15 Power Supply (APSU112)

3. Unplug reserve battery cable from CN-BAT connector of power supply.
4. Unplug the DC cable from the "CN OUT" connector (P16) and cut the tie-wrap. Be careful not to cut any wires.
5. Remove the FG screw from left side of power supply to free FG wire/terminal and ground wire.
6. Remove the Power Supply from the Cabinet (see Figure 3-16).
7. If you are going to remove the ABCS battery charger, use pliers to unlock the plastic holders of the ABCS1A.
8. Unplug the AC power cord from the AC-IN connector.

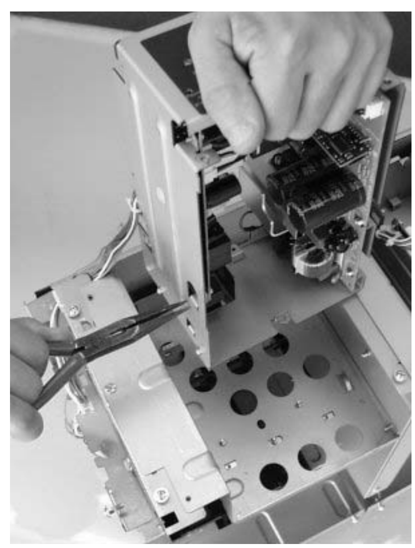


Figure 3-16 ABCS Power Supply Removal

Replacing the Power Supply

1. Make sure that the power supply switch is Off and that the AC power cable is not plugged into an outlet.
2. Set the power supply in its proper place in the cabinet (see Figure 3-16).
3. Secure the power supply to the cabinet with the screws.
4. Connect the green/green-yellow wire from the AMAU motherboard to the FG screw on the power supply.
5. Plug the DC cable into the CN OUT connector.
6. Install the ABCS battery charger.
7. Plug in the reserve battery cable to the CN-BAT connector of the ABCS battery charger.
8. Plug in the AC power cord connector into the AC-IN plug.
9. Insert and tight the two screws in front of the power supply (see Figure 3-15).
10. Plug the BASE/EXP jumper plug into the appropriate BASE or EXP connector on the power supply (see Figure 3-14).

Step 16: Set Jumpers and Install Option PCBs onto the ACTU

➤ To install the ACTU2A

Refer to Figure 3-18 and perform the following steps on the ACTU2A.

1. Set the battery jumper, "BATT," to the "On" position.
2. Make sure the WDT jumper plug is set to the ON position.

Note Unlike the ACTU1A, the ACTU2A does not use the AETS or the ARCS option PCBs. NIC and DTMF circuits are built into the ACTU2.

3. Install needed option PCBs onto the ACTU (AMDS, BSIS).
4. Place option PCB arrow side up over the plastic stand-offs with the connectors and stand-off holes on the ACTU. Snap option PCB securely into place.
5. Insert the SmartMedia card (gold contacts face left, notched corner faces forward and up) into the SmartMedia slot on the ACTU.
6. Make sure the power supply switch is Off.
7. Install the ACTU into the Base Cabinet (see following photos).

Notes

- ACTU2A requires R1.3 software or later.
- MOH/BGM source volume is controlled by software PAD in Program 107-01, 02 and 03. Mu/A law must be set to Mu law in software Program 105-35 for North America.
- For details on jumpers and add-ons (subassemblies) for the ACTU, see Table 3-2 on page 3-22.

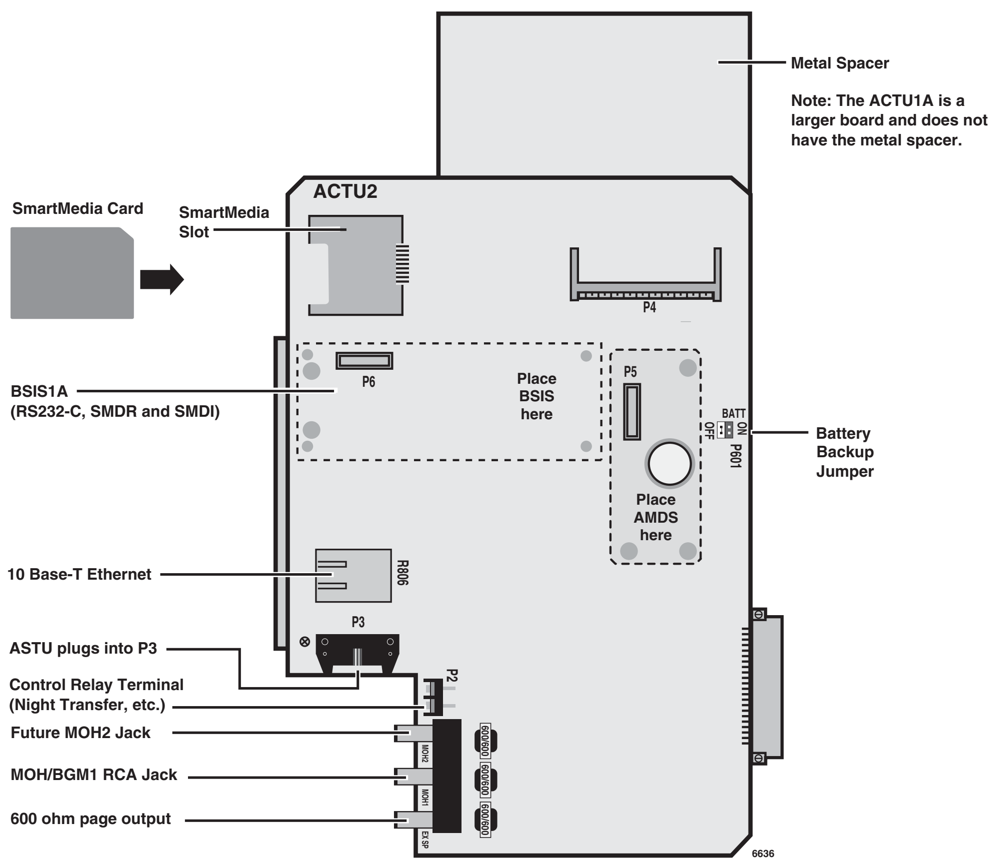


Figure 3-17 ACTU2A PCB (CTX100 Processor)

➤ To Install ACTU1A

Refer to Figure 3-18 with the following steps.

1. On the ACTU PCB, set the battery jumper, “BATT,” to the “On” position.
2. On the ACTU, make sure the Mu/A jumper plug is set to the Mu position (U.S. and Canada).
3. On the ACTU PCB, set the BBMS jumper “ATTACHED BBMS,” to the “NO” position.

Note If you are installing the AETS option PCB, before mounting the AETS, dress its green jumper wire under and behind the Ethernet port and out the top as shown in Figure 3-18. Remove the screw just above the AETS, place the jumper wire ring over the hole and replace the screw to hold the jumper wire ring in place.

4. Install needed option PCBs onto the ACTU (AETS, AMDS, BSIS, ARCS).
5. Place option PCB arrow side up over the plastic stand-offs with the connectors and stand-off holes on the ACTU. Snap option PCB securely into place.
6. Insert the SmartMedia card (gold contacts face left, notched corner faces forward and up) into the SmartMedia slot on the ACTU.
7. Make sure the power supply switch is Off.
8. Install the ACTU into the Base Cabinet (see following photos).

Note For more details about the jumpers and add-ons (subassemblies) for the ACTU, see Table 3-2 on page 3-22.

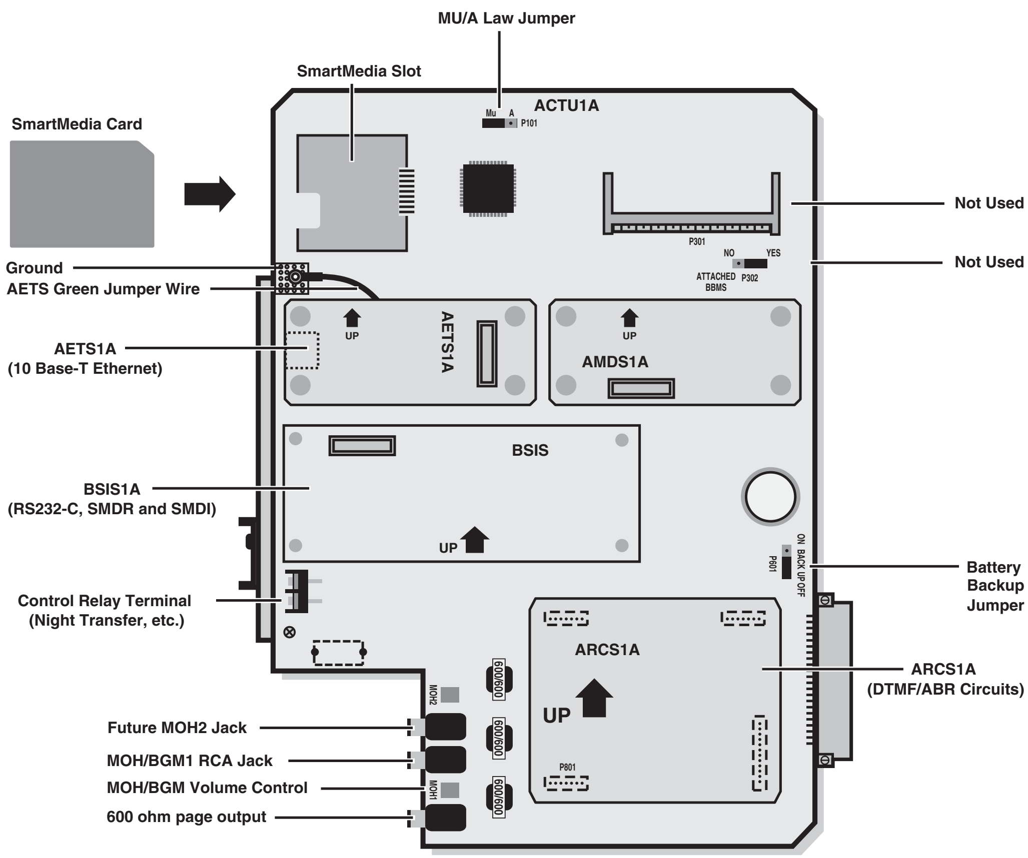


Figure 3-18 ACTU PCB (CTX100 Processor)

Step 17: Install the Main Processor (ACTU) PCB

The Strata CTX100 Base cabinet has one slot dedicated to the processor PCB.

1. Slide the ACTU processor PCB into the first slot on the left side of the cabinet (as shown).

6003

2. Loosen the screw slightly, then slide the processor lock upwards. Tighten the screw so that the PCB is locked into place.

6004

Step 18: Install Other PCBs into the Cabinet(s)

1. Each PCB must be configured for the applicable hardware options prior to installation of the PCB to the CTX100 cabinets.

   Configuration instructions for individual PCBs are in Chapter 6 – PCB Installation and Chapter 10 – MDF PCB Wiring. Configuration instructions for external hardware options are provided in Chapter 12 – Peripheral Installation.

2. Use the PCB placement guide in "Worksheet 5: Strata CTX100 Cabinet Slots" on page 2-26 to determine which PCB slot can be used for each PCB type.
3. Slide the PCB Slot Locking Bar to the right, then insert each of the PCBs; push the PCBs firmly toward the motherboard, making sure that the connectors are secured (see Figure 3-19). Lightly tug on each PCB to make sure that it's installed securely.
4. After all the PCBs are installed, slide the PCB Slot Locking Bar to the left to lock the PCBs into place.
5. Configure the PCBs for software options through programming. Refer to the *Strata CTX Programming Manual* for more detailed programming instructions.

Note The Base and Expansion cabinets have four universal PCB slots each which can accept the same universal PCBs as the CTX670. CTX100-only components are shown in Table 3-2.

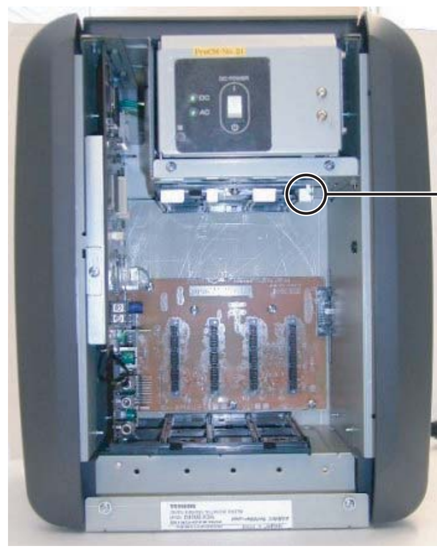


Figure 3-19 PCB Slot Locking Bar

Table 3-2 CTX100 Cabinet and Processor Components

PCB	Provides	Comments	Installs On
CHSUB112	Base Cabinet with power supply without battery charger.	Provides 4 universal slots.	
CHSUE112	Expansion Cabinet with power supply without battery charger.	Provides 4 universal slots.	
APSU112	Power Supply for CTX100.	Spare power supply.	Base or Expansion Cabinet
ACTU	System Processor PCB. (Optional PCB attachments include: modem. Ethernet 10BaseT, DTMF Receiver/Busy Tone Detector and Serial Interface Unit.	One per system. Supports 8 PCB slots (4 slots in the Base Cabinet + 4 more in the Expansion Cabinet). **Note** The ACTU2A works with software R1.3 and higher.	
ARCS (Optional)	DTMF Receiver and ABR Circuits.	One per system. Provides 16 DTMF and 16 ABR circuits.	ACTU1 only

Table 3-2 CTX100 Cabinet and Processor Components *(continued)*

PCB	Provides	Comments	Installs On
AETS (Optional)	Ethernet LAN (10 BaseT)	One per system. Provides 10Mbps LAN by one RJ45 for WinAdmin.	ACTU1 only
AMDS (Optional)	V.34 Modem	One per system to provide 33.6kbps maximum modem for WinAdmin.	ACTU
BSIS (Optional)	Serial interface unit (same unit used for CTX670).	Provides four RS-232 serial ports (SMDR, SMDI)	ACTU
ABCS (Optional)	Battery Charger Circuit.	One per Power Supply for connection of Reserve Power (requires ABTC-3M Battery Cable).	APSU112A

Step 19: Attach and Route PCB Cables

1. Determine the direction that you want the cables to exit the cabinet(s) from the following:
   - **Single Direction Cable Routing** – Cabling from the Expansion Cabinet can run through the Base Cabinet and exit from the Base Cabinet (see Figure 3-20).

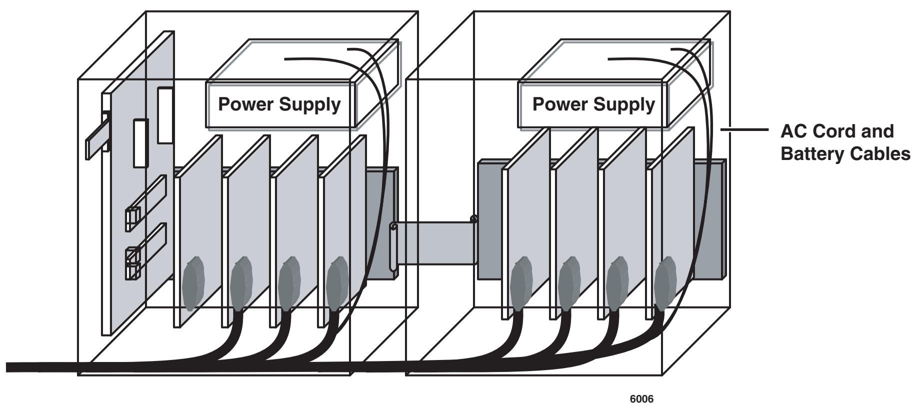


Figure 3-20 Single Direction Cable Routing

   - **Opposite Direction Cable Routing** – Cabling from the Expansion Cabinet can run through the right and left sides (see Figure 3-21).

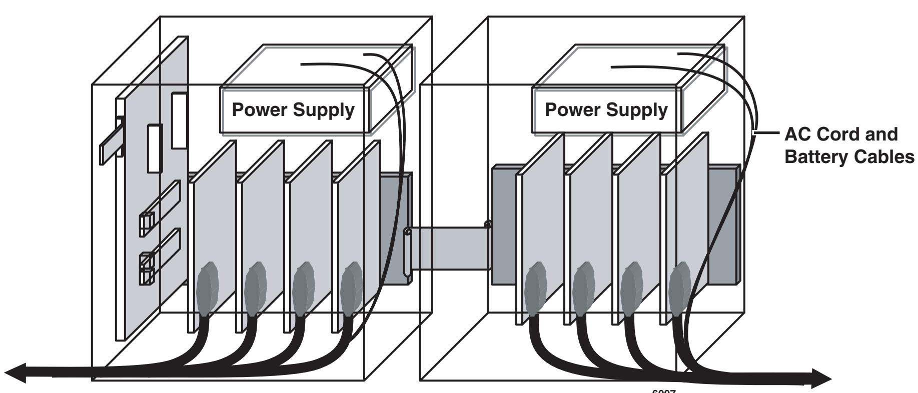


Figure 3-21 Opposite Direction Cable Routing

Strata CTX100-S/
CTX100 Installation

- **Do Not Run Cables Out the Top** – Cabling from either cabinet should be routed out the lower sides, not from the top of the cabinet(s) (see Figure 3-22).

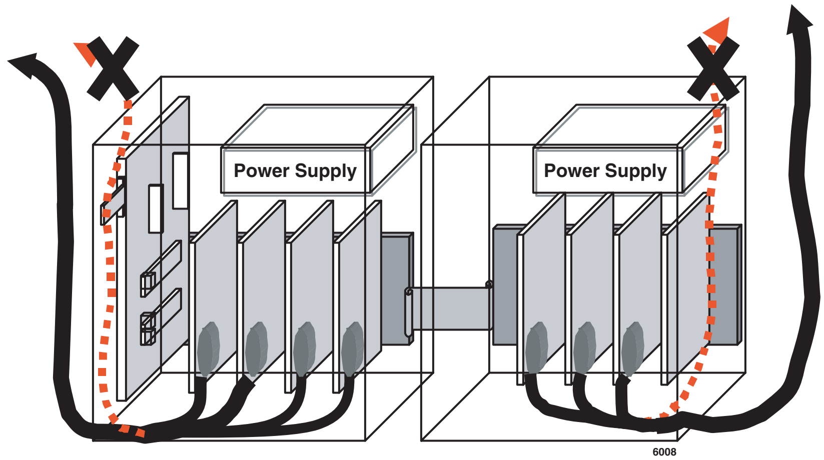


Figure 3-22 Avoid Improper Cable Routing

2. Remove the left or right cover(s) of the cabinet and knock out the rectangle(s) to create a hole for the cables, as needed (see Figure 3-23).

Note Cables can be run out of either side of Base or Expansion cabinets.

3. Connect applicable wiring (e.g., modular CO line cords, 25-pair amphenol connector cables) to the front of the PCBs as described earlier.

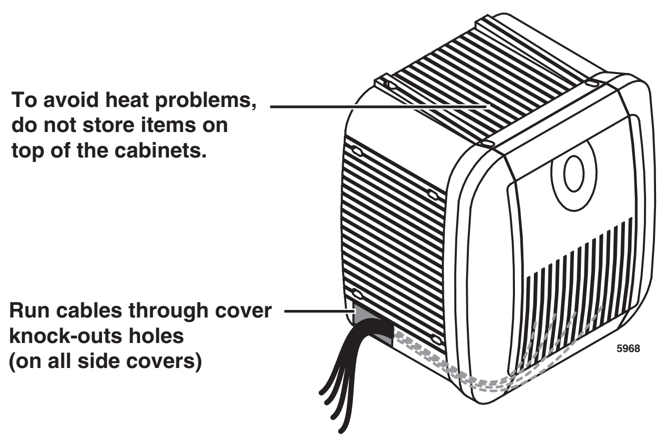


Figure 3-23 Base and Expansion Cabinet Cables and Connectors

4. Secure all Amphenol cables to the cabinets with tie wraps (see Figure 3-24).

Figure 3-24 Tie-wrap Cables

Strata CTX670 Installation 4

This chapter explains how to install the Strata CTX670 system. It includes information on site requirements and provides installation instructions for various cabinet configurations. It also explains how to install ground wiring, AC power cabling, reserve power (Battery Backup) cabling, and Printed Circuit Board (PCB) cabling.

Inspection

When the system is received, examine all packages carefully and note any visible damage. If any damage is found, do not open the packages. Contact the delivery carrier immediately and make the proper claims.

After unpacking (and before installing), check the system against the packing list and inspect all equipment for damage. If equipment is missing or damaged, contact your supplier immediately.

Be sure to retain original packaging materials for re-use when storing or transporting system hardware.

Packaging and Storage

CAUTION! **When handling (installing, removing, examining) PCBs, do not touch the back (soldered) side or edge connector. Always hold the PCB by its edges.**

When packaging and storing the system, remove PCBs from the system cabinet (the power supply may remain installed in the cabinet for storage and shipment). PCBs should be packaged in their original antistatic bags for protection against electrostatic discharge. Be sure to package equipment in its original shipping containers.

Site Requirements

Input Power

The CTX670 requires an input power source of 115±10VAC or 208±20VAC or 240±20VAC, 50/60 Hz, single phase. For up to five cabinets; 208VAC or 240VAC is required for six or seven cabinets. The system requires one or two AC outlets that must be dedicated to system use, fused, and grounded.

Each Remote Expansion Cabinet requires 3.2 amps. maximum. The remote cabinet installation requires one or two AC outlets that must be dedicated to system use, fused, and grounded.

See Cabinet Installation Considerations for complete AC power cabling, ground wiring and battery installation instructions for local and remote cabinets.

CAUTION! **To avoid accidental power turn-off, do not use an On/Off wall switch for AC circuits dedicated for the use of CTX670.**

A reserve power source (two or four customer-supplied 12VDC batteries) can be connected to the CTX670 to serve as a backup in case of power failure.

Separate reserve power may be required for remote expansion cabinets.

Clearance and Location

The Base and optional Expansion Cabinets can be either floor or wall mounted. Figure 4-1 shows the minimum clearance requirements for up to seven cabinets.

Notes

- Floor mounting requires the following additional hardware:
  - BFIF – floor mounting stands and brackets.
  - BCCB – electrical conduit box, if three or more cabinets are installed.
- Wall mounting requires a plywood (3/4 inch thick) backboard.

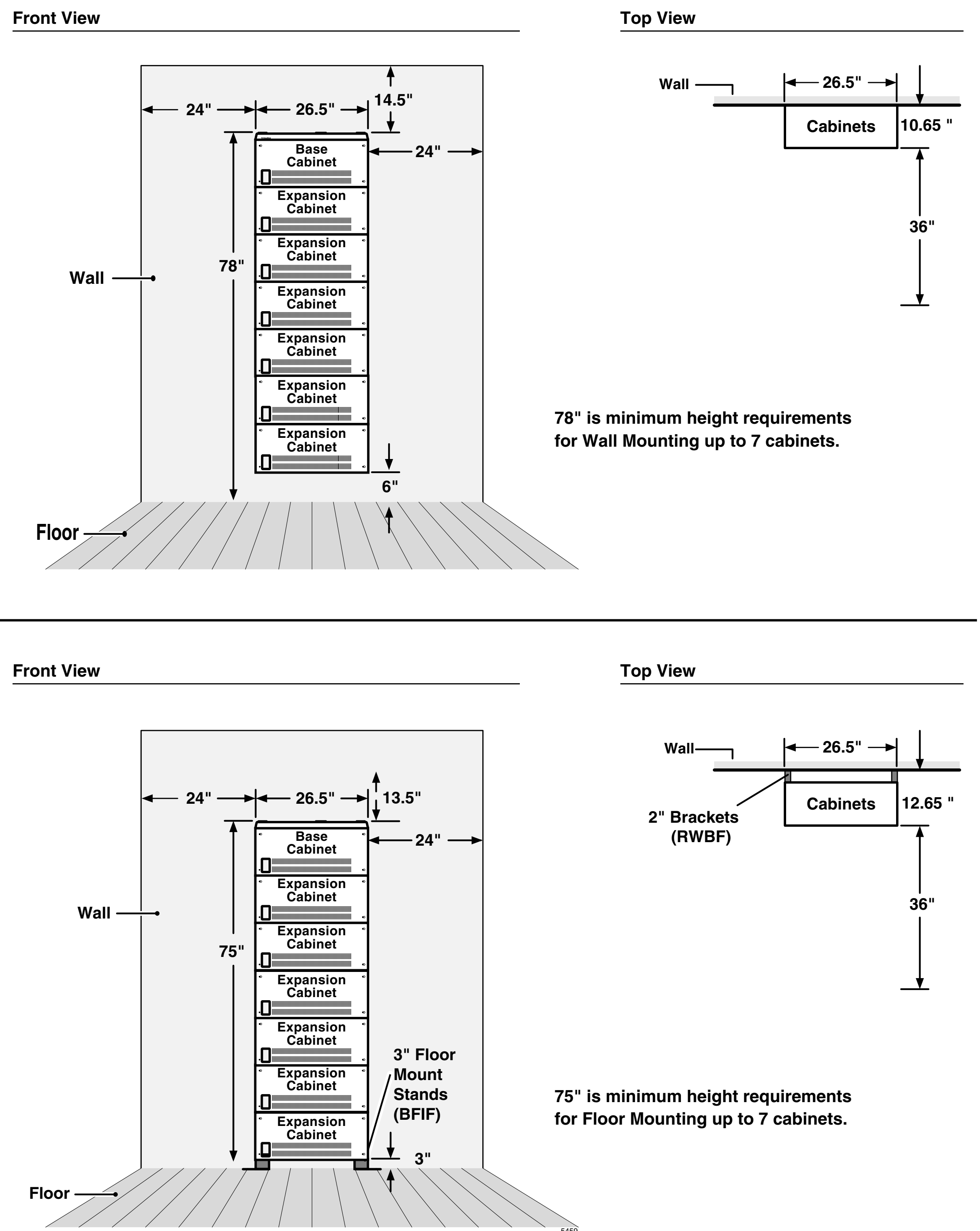
When selecting a location for the cabinets, the location *must be:*

- Dry and clean
- Well-ventilated
- Well-illuminated
- Easily accessible

The location *must not be*:

- Subject to extreme heat or cold
- Subject to corrosive fumes, dust, or other airborne contaminants
- Subject to excessive vibration
- Next to television, radio, office automation, or high frequency equipment

Optional customer-supplied reserve batteries require a well-ventilated location close (within nine feet) to the CTX670 cabinets.



Note The Base Cabinet may be mounted at the bottom of the stack.

Figure 4-1 CTX670 Minimum Clearance Requirements

Power Considerations

Each CTX670 Base and Expansion Cabinet houses a power supply that furnishes power to all of the stations and some of the peripherals that interface with the cabinet (see Table 2-60, "Strata CTX670 Electrical Characteristics" on page 2-47).

Reserve Power

Two or four customer-supplied 12VDC reserve batteries can be connected to the system to maintain normal operation during a power failure (see Table 2-63 on page 2-49 and Table 2-60 on page 2-47). The batteries are kept in a highly-charged state by the standard power supply and must be connected when the system is operating normally. Fully charged batteries must be connected when normal AC power is available, batteries cannot be connected after/during an actual power failure.

Underwriters' Laboratory (UL) and local electrical codes require certain standards for connecting commercial AC and reserve power to the CTX670 system. Table 4-1 describes which assemblies may be required to meet UL and local electrical code standards.

FCC Registration Information

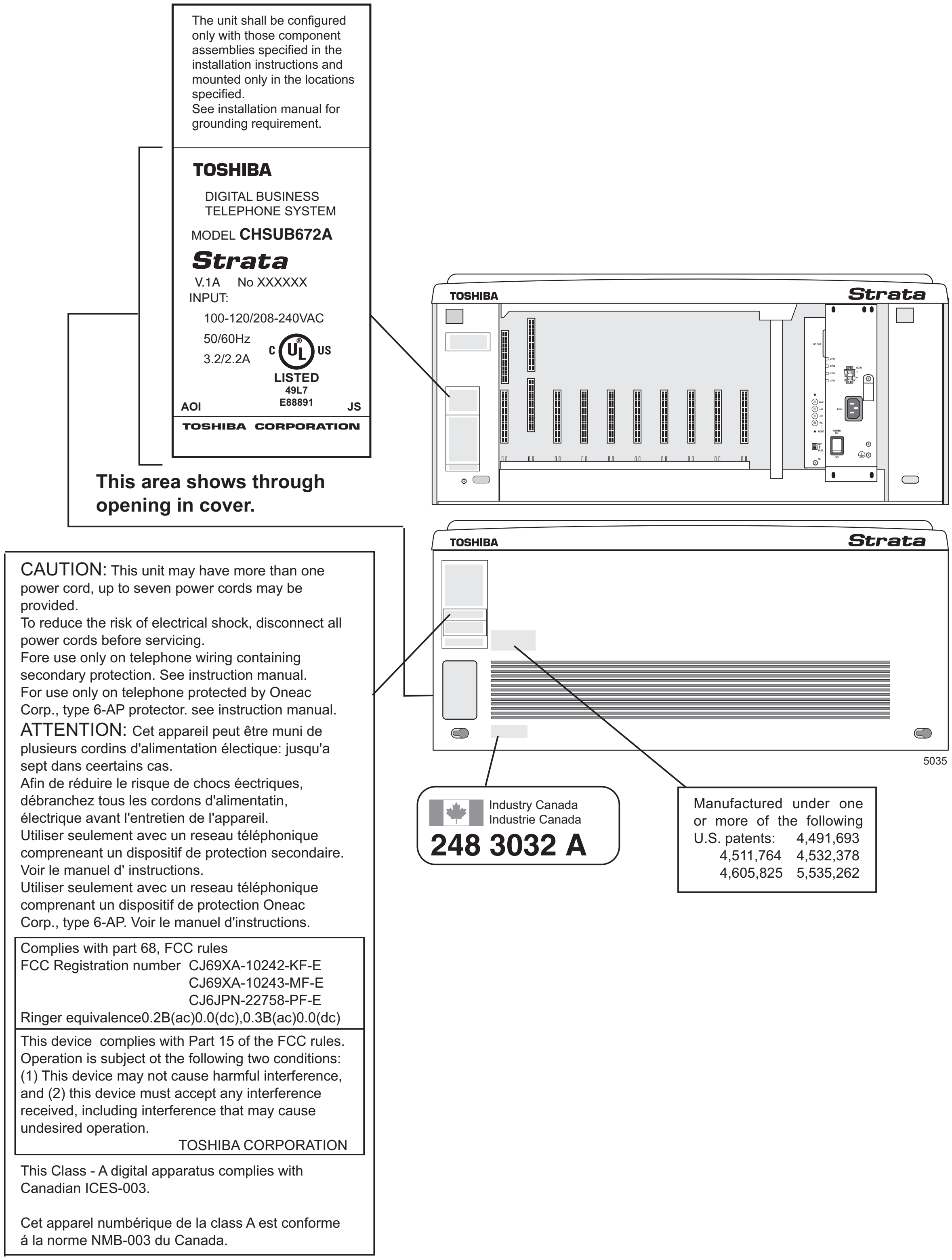


Figure 4-2 Location of Approval Labels

Cabinet Installation Considerations

The Base (CHSUB672) and Expansion (CHSUE672) Cabinets can be wall or floor mounted. To make it easier to add cabinets (after the initial installation) when a customer needs to expand, install the Base Cabinet on top for wall-mount installations and on the bottom for floor-mount installations.

The dimensions of the Base and Expansion Cabinets are:

Height: Base Cabinet: 11 3/4 inches

Height: Expansion Cabinet/Remote Expansion Cabinet: 10 inches

Width: 26 1/2 inches

Depth: 10 5/8 inches

Weight: approx. 30.5 lbs. (14 kg.)

Note The weight approximates a cabinet completely filled with PCBs. Weight may vary slightly, depending on PCBs.

Recommended Installation Sequence

Step	Reference Information
1. Install power supplies in cabinets.	"Install Power Supply" on page 4-6.
2. Mount cabinets on wall or floor.	"Wall Mounting the Base (Top) Cabinet" on page 4-10.
	"Cabinet Floor Mounting" on page 4-33.
3. Install ground wiring.	"Ground the System" on page 4-18.
4. Install AC power cabling to cabinets.	"Install AC Power Components" on page 4-20.
5. Install reserve power cabling.	"Install Reserve Power" on page 4-29.
6. Install PCBs and PCB cabling.	Figures 4-38~4-23, 4-42 and the section titled "Install Processor and Universal PCBs" on page 4-43.

Note Each cabinet requires four wood screws (#12 X 2 inch size) for wall mount installation. Wood screws are not provided with the system.

Step 1: Install Power Supply

The Base and Expansion Cabinets are factory-shipped without the power supply installed. The CTX670 cabinets use the BPSU672 power supply, which is different from the DK280 or DK424.

➤ **To install power supplies in cabinets of new or installed systems**

1. Remove the power supply from its box. The power supply AC power cord for 120VAC and the power supply mounting screws are provided with the KSU cabinet. If the system is to be powered by 208VAC or 240VAC, another powered cord, BACL240 must be ordered separately for each power supply.
2. Make sure that the front and right side covers are removed from the cabinet (see Figure 4-5).
3. Slide the power supply into the right side of the cabinet so that its four mounting holes align with the four cabinet mounting holes. (Make sure that the two backplane FG wires are positioned between the FG wire holder and the power supply.)

Note The backplane FG wires are not safety grounds: they are required for proper system CO line operation.

4. Plug the Back Plane DC OUT cable plug into the DC OUT connector on the power supply. (The plug has a guide key on it to ensure that it is plugged in correctly.)
5. Secure the FG wire spade lug to the power supply with the FG screw.
6. Secure the power supply to the cabinet with the four provided screws.
7. If the cabinet is the Base Unit, a standalone Remote Expansion Cabinet, or the first in a stack of Remote Expansion Cabinets. Set the Exp/Base switch to the "Base" position (see Figure 4-3).
8. If the cabinet is an Expansion Unit, set the Exp/Base switch to the "Exp" position.

Important! *The power supply set as "Base" is the master and has On/Off control over all other power supplies, which are designated as slaves. If the master power supply is turned Off or On, all other power supplies will automatically turn Off or On. (Individual slave power supplies must be turned On.)*

9. See Figure 4-3 to ensure that the power supply is properly installed.
10. Install power supplies in all cabinets, using Steps 1~9 of this procedure.
11. Install the Base and optional Expansion Cabinets, ground wiring, and cabinet bonding plates, AC and reserve power cabling, and PCB cabling per the "Recommended Installation Sequence" on page 4-6.

Check the -24 Volt Circuit Breakers

The BPSU672A provides four -24v circuit breakers as shown in Figure 4-3. If a low resistance between –24 volts and ground exists the circuit breaker will trip. Usually the front panel DC green LED indicator will turn off but not always. Also if AC power is recycled the DC LED indicator may turn back on – even if the –24 volt circuit breaker is tripped.

Circuit Breaker Location and Slot Assignments (see Figure 4-3)

- The circuit breaker 24V1~24V4, located directly below DC-out cable, protects the cabinet slots as shown in the Circuit Breaker assignment table.

Reset Circuit Breaker

1. A defective PCB or an external short on the MDF may cause the circuit breaker to trip.
2. If you suspect that a –24 volt circuit breaker has tripped, try to reset it by:
    - Turn the power supply DC power switch off and unplug the power supply AC power cord from the AC outlet – the inside of the power supply has exposed voltages.
    - Gently press in each circuit breaker and listen for or try to feel it click. If the breaker was tripped, you will hear or feel it click back to the set position.
    - If the circuit breaker resets, pull the PCBs and check for MDF shorts associated with the slots assigned to the tripped circuit breaker. Remove any defective PCBs and MDF shorts.
    - Restore power and verify the system is working normally.
3. Replace the power supply if the circuit breaker continues to trip and a defective PCB or short cannot be found.

Check the Power Factor Indicator and Reset Button

The front panel of BPSU672A provides a Power Factor LED and Reset button. If the cabinet power factor is exceeded by overload of PCBs, the PF LED will turn on.

➤ If the PF LED indicator turns on, press the PF reset button with a pointed tool or pencil. If the PF LED turns off and does not turn on again it may have been turned on by a current surge while installing a PCB while the power supply was turned-on.

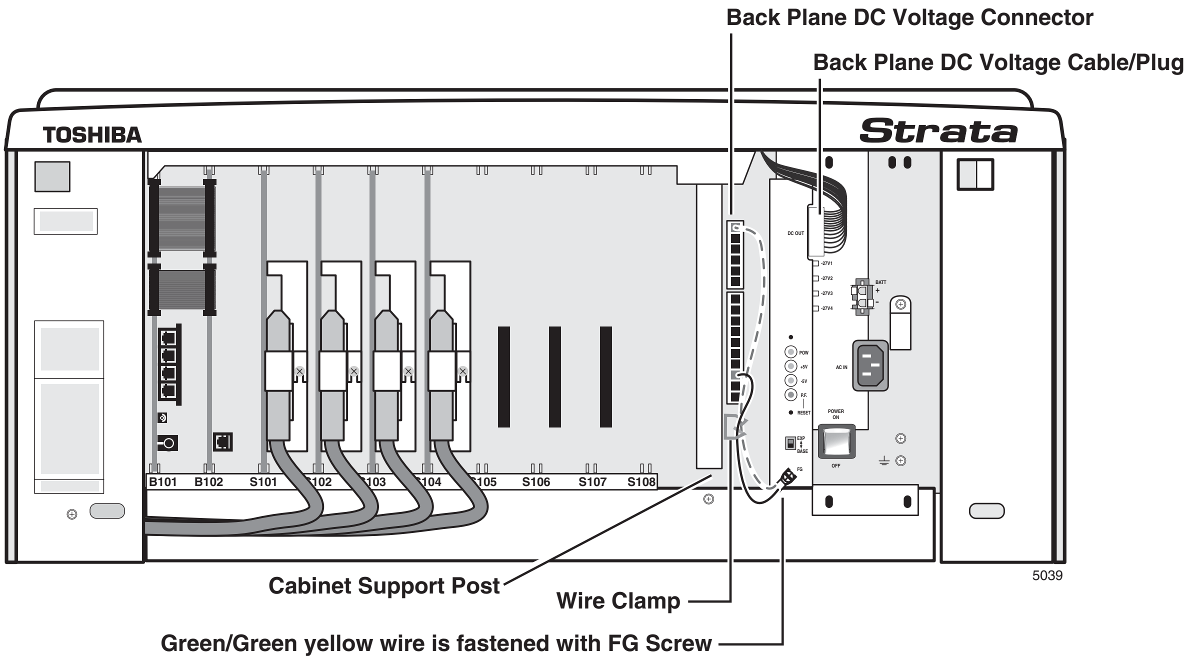
➤ When a PF alarm is indicated, check that the cabinet power factor is not exceeded using the "Worksheet 7 – System Power Factor Check" on page 2-42. If the Power factor has been exceeded relocate any PCBs that are causing the PF to be exceeded.

Power Supply (BPSU672) Removal

1. Remove the front and right side covers (Figure 4-5) from the cabinet. Remove the right side covers of other cabinets as needed to disconnect wiring.
2. Turn the power supply Off, and disconnect the AC power cord, all ground wiring and reserve power cabling that is connected to the power supply.
3. Disconnect the back plane DC OUT cable plug from the DC OUT connector.
4. Loosen the four mounting screws securing the power supply to the cabinet and remove the power supply.

Power Supply Replacement

➤ Install the replacement power supply per "Install Power Supply" on page 4-6.

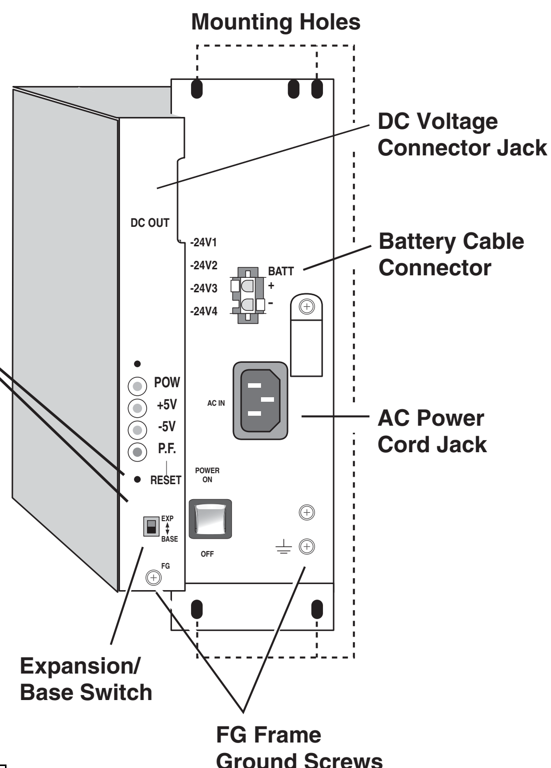


24V Circuit Breaker Assignments:

Base Cabinet	
24V-1	S101, S102
24V-2	S103, S104
24V-3	S105, S106
24V-4	S107, S108

EXP. Cabinet	
24V-1	S_01, S_02
24V-2	S_03, S_04
24V-3	S_05, S_06, S_07
24V-4	S_08, S_09, S_10

Power Factor (PF) alarm LED indicates the cabinet PF was exceeded. Correct the problem and press the RESET button to clear the alarm.



DC Voltage Specification		
+5V (+4.5 ~ +5.5), 4.0 amps	BATT (Volts)	
-5V (–4.5 ~ –5.5), 0.8 amps Expansion Cabinet only	+	0
-24V (–26.3 ~ –27.8), 6.0 amps	–	–26.3 ~ –27.8 [2]

1. Back Plane DC Voltage Plug must be plugged into Power Supply when checking voltages.
2. On BPSU672, the BATT output is 0 volts unless connected to good batteries.

DC Voltage Connector Plug Pin Wires						
Yellow	**Blue**	**White**	**Green**	**Green**	**Green**	**Red**
-24	-5	+5	0	0	0	+5
Yellow	**Yellow**	**Yellow**	**Green**	**Green**	**Green**	**Red**
-24	-24	-24	0	0	0	+5

Figure 4-3 Power Supply Installation

Step 2: Mount Cabinets

There are two methods of mounting cabinets: wall or floor mounting. Wall mounting the most common and economical method is described below. The floor mounting description begins on page 4-33.

Note Toshiba recommends installing cabinets (see Figures 4-4~4-10) from the top down, Base Cabinet on top, first Expansion Cabinet below it, second cabinet below that, etc.

Wall Mounting the Base (Top) Cabinet

Follow these instructions to wall mount the Base Cabinet or the first Remote Expansion Cabinet. A wooden backboard between the cabinet and the wall is necessary (see Figure 4-4).

1. Obtain a board, such as plywood, that is at least 3/4 of an inch thick. The board should be at least 6-1/2 feet high (completely expanded systems with seven cabinets require this much height) and 26 inches wide (minimum).

   Secure the board to the wall with wood screws with the bottom edge of the board is six inches above the floor. (If there are wall studs, make sure the screws align with the studs.)
2. Remove the front, back, and side covers from the Base Cabinet or first Remote Expansion Cabinet (see Figure 4-5).

Note The two screws on the front cover and the two screws on each side cover should be loosened just enough to slide the covers off. The front cover slides left and the side covers swing out and down for removal.

3. Hold the Base Cabinet back cover against the wall or backboard so that its two top mounting holes are approximately 6-1/2 feet (78 inches) above the floor. This allows up to seven cabinets to be installed (top-down) with a six-inch clearance between the floor and bottom cabinet (see Figures 4-6 and 4-7).
4. Use a level to make sure that the back cover is held level.
5. Trace the upper arch of the top mounting holes with a pencil.
6. Remove the back cover from the wall. Draw a line between the top two marking hole marks.
7. Drill holes on the line in the middle of the arch tracing.
8. Screw #12 X 2 inch size wood screws into the two drilled holes, leaving about 1/8 of an inch clearance between the screw heads and the wall.
9. Hang the Base Cabinet or first Remote Expansion Cabinet back cover from the top two screws and secure the screws into the wall.
10. Drill holes at the bottom two mounting holes of the back cover, and secure #12 X 2 inch wood screws into the two holes.
11. If installing a Base Cabinet or first Remote Expansion Cabinet back cover to the wall: Position the cabinet on the back cover cabinet hangers, slide the cabinet right to the proper mounting position, and secure the cabinet to the back cover with two screws on the right side of the cabinet. If installing Expansion Cabinets, skip to “Wall Mounting Expansion Cabinets” on page 4-11.
12. Install ground wiring, AC and reserve power cabling, and PCB cabling per the “Recommended Installation Sequence” on page 4-6.
13. Fill out the slot identification label on the cabinet (see Figure 4-8).
14. Reinstall the front cover, top cover, and side covers onto the cabinet.

Wall Mounting Expansion Cabinets

1. Remove the front, back, and side covers from the Expansion Cabinets.

Note The two screws on the front cover and the two screws on each side cover should be loosened just enough to slide the covers off. The front cover slides left and the side covers swing out and down for removal.

2. Hold an Expansion Cabinet back cover against the wall so that its top locating parts align with the bottom locating parts of the Base Cabinet back cover (see Figure 4-4 on page 4-12). To secure the Expansion Cabinet back cover to the back board, repeat Steps 5~11 from “Wall Mounting the Base (Top) Cabinet” on page 4-10.
3. To install additional Expansion Cabinet back covers, repeat Step 2 above.
4. Starting with the top Expansion Cabinet back cover (which is fastened to the wall), position an Expansion Cabinet on the back cover cabinet hangers. Slide the cabinet to the right to the proper mounting position, and secure the cabinet to the back cover with two screws to the right side of the back cover. Repeat for all other Expansion Cabinets.
5. Loosen the bonding connection plates fastened on both sides of the first Expansion Cabinet (see Figure 4-9) then fasten the plates between the Base Cabinet and the first Expansion Cabinet. Repeat to connect the first Expansion Cabinet to the second Expansion Cabinet, etc.
6. Base Cabinet: Loosen data cable door locking screws and open data cable doors; then connect the first Expansion Cabinet data cable to the “CAB 2” (top) data cable connector on the Base Cabinet. Install data cables in appropriate connectors for all other Expansion Cabinets. (See Figure 4-12.
7. After all data cables are installed, close data cable doors and secure with the locking screw.

Important! *Data cable door screws must be firmly tightened for proper system operation. Data cables for DK280 and DK424 cabinets are not compatible with CTX670 cabinets.*

8. Install ground wiring, AC and reserve power cabling, and PCB cabling per the “Recommended Installation Sequence” on page 4-6.
9. Fill out cabinet/slot identification labels on each cabinet.
10. Reinstall covers onto cabinets.

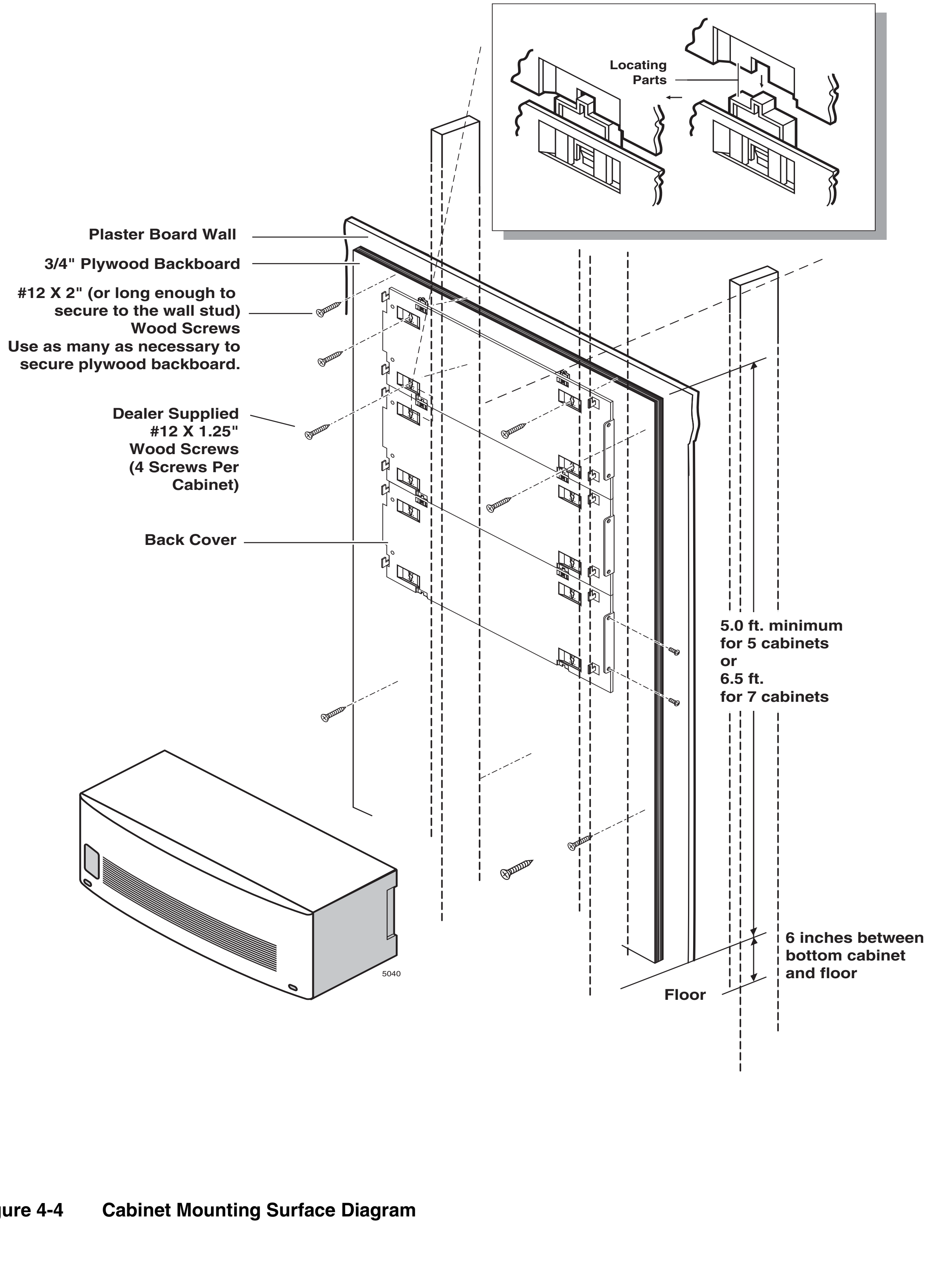


Figure 4-4 Cabinet Mounting Surface Diagram

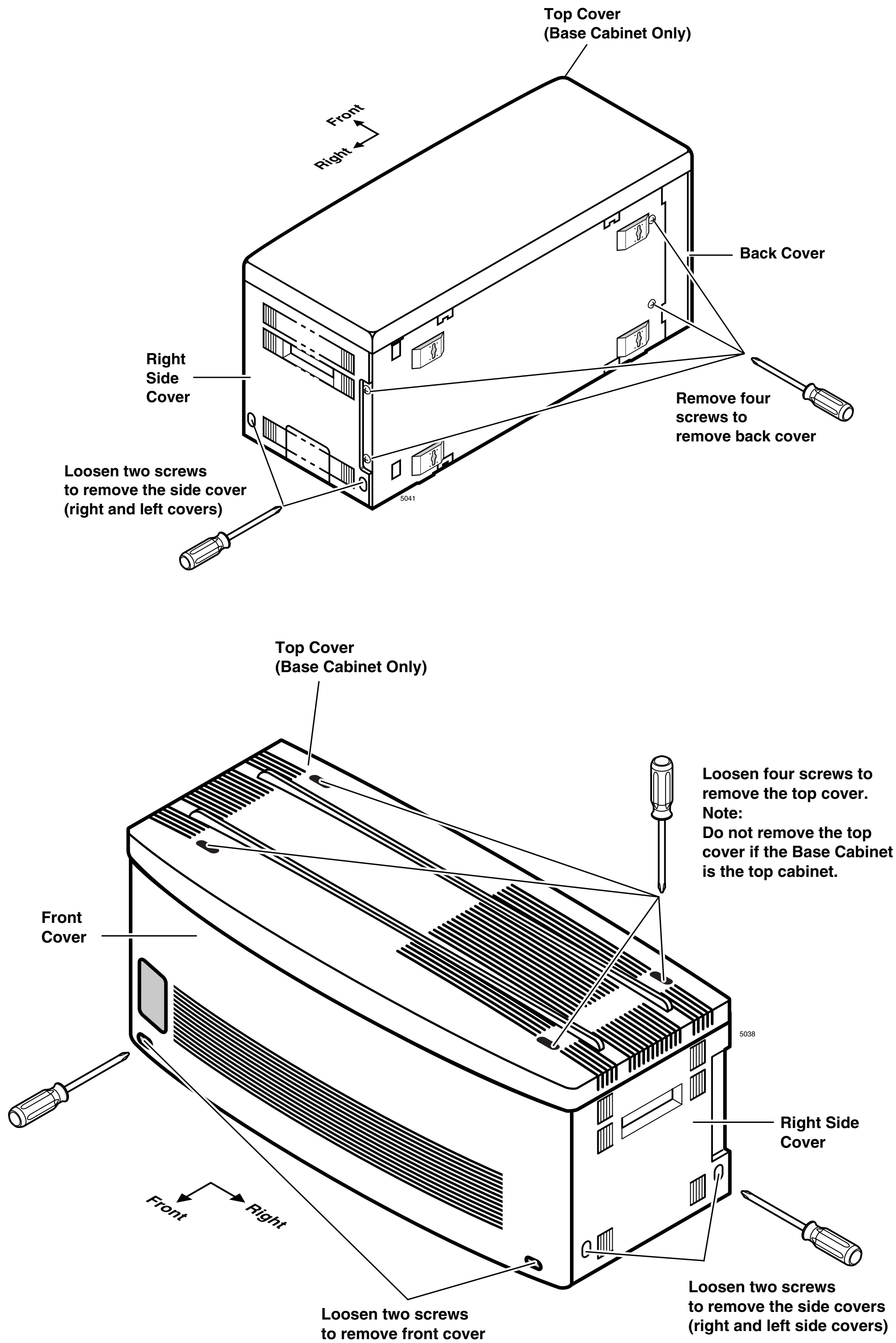


Figure 4-5 Cabinet Cover Removal and Installation

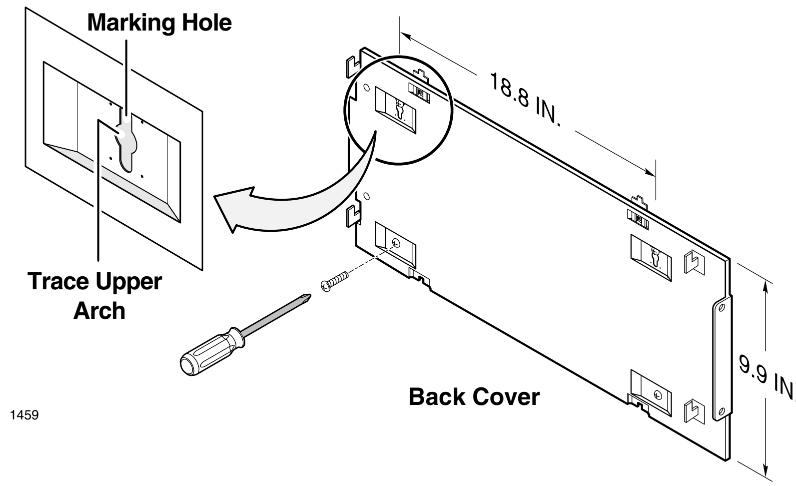


Figure 4-6 CTX670 Back Cover Mounting Holes

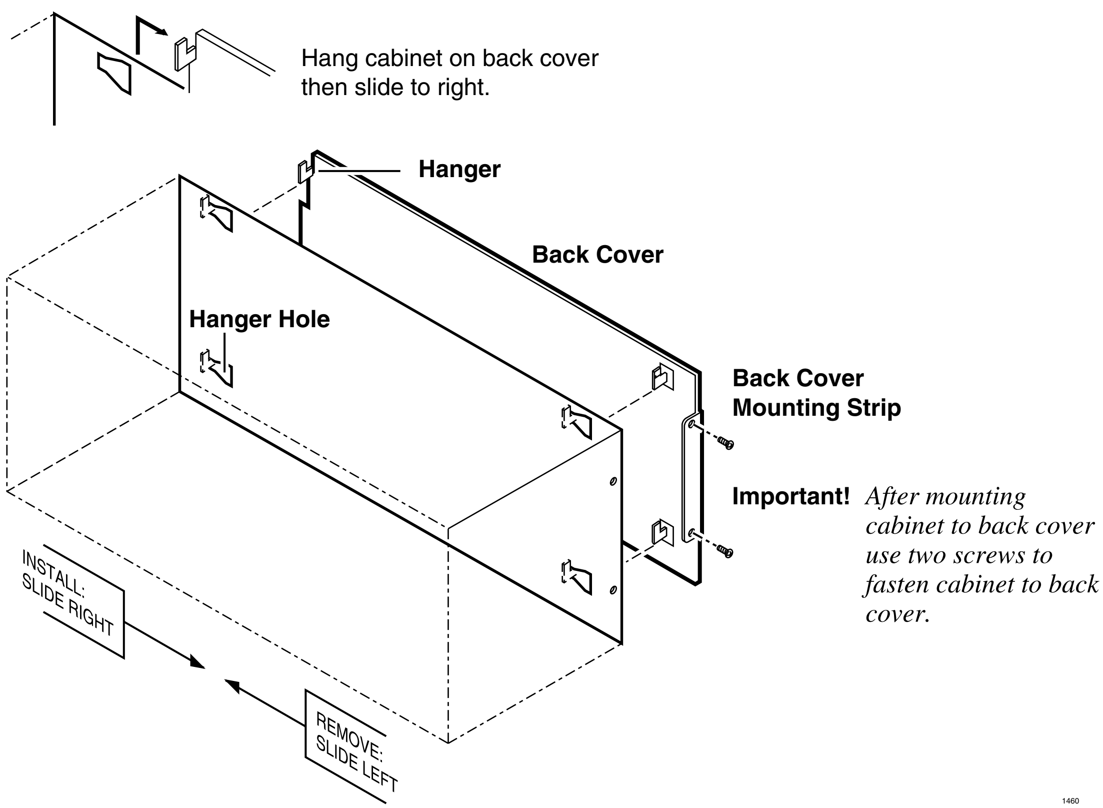


Figure 4-7 CTX670 Mounting Cabinet on Back Cover

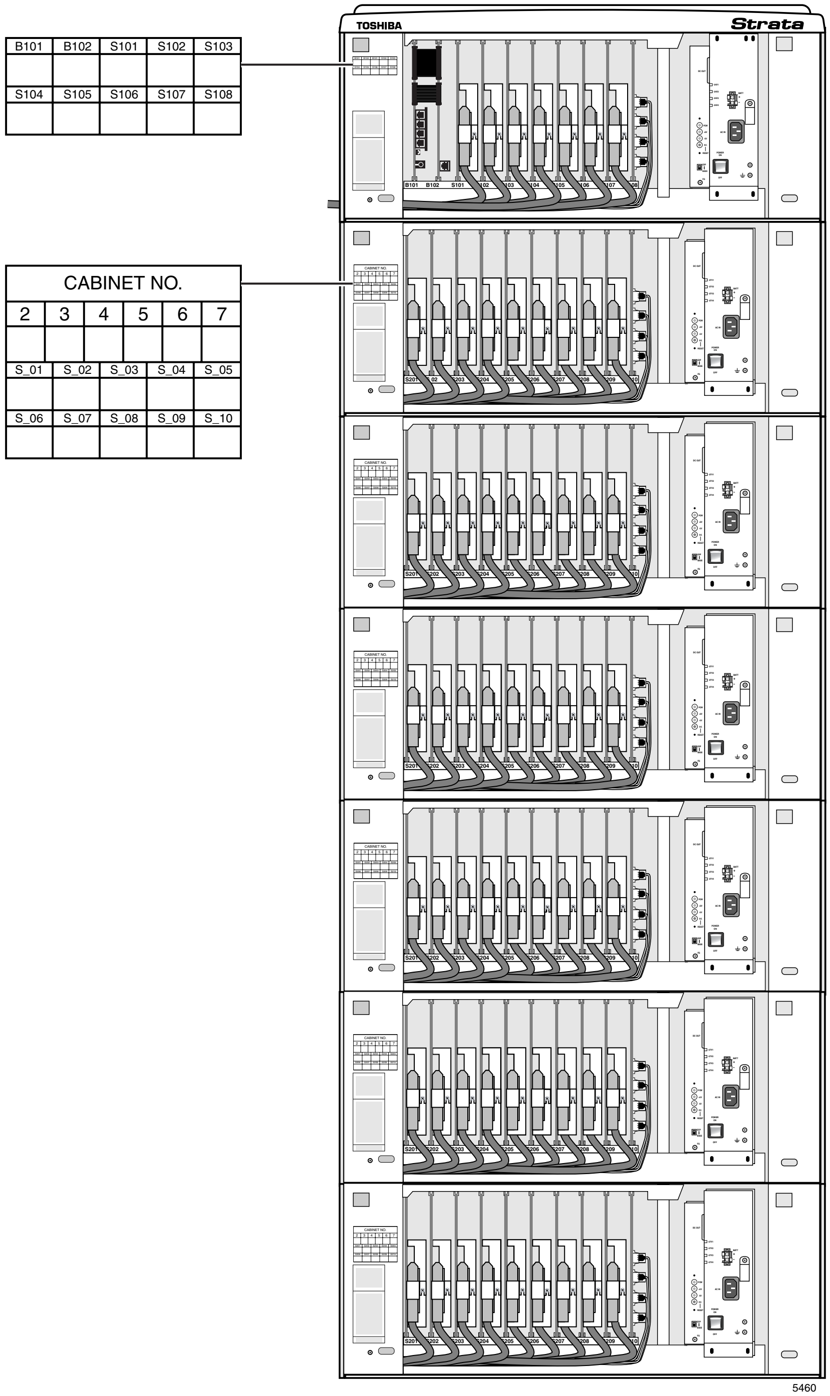


Figure 4-8 CTX670 Cabinet Interior

Step 3: Install Data Cables

1. After mounting the CTX670 cabinets, install the data cables. Then, install the bonding plate per Figure 4-9.

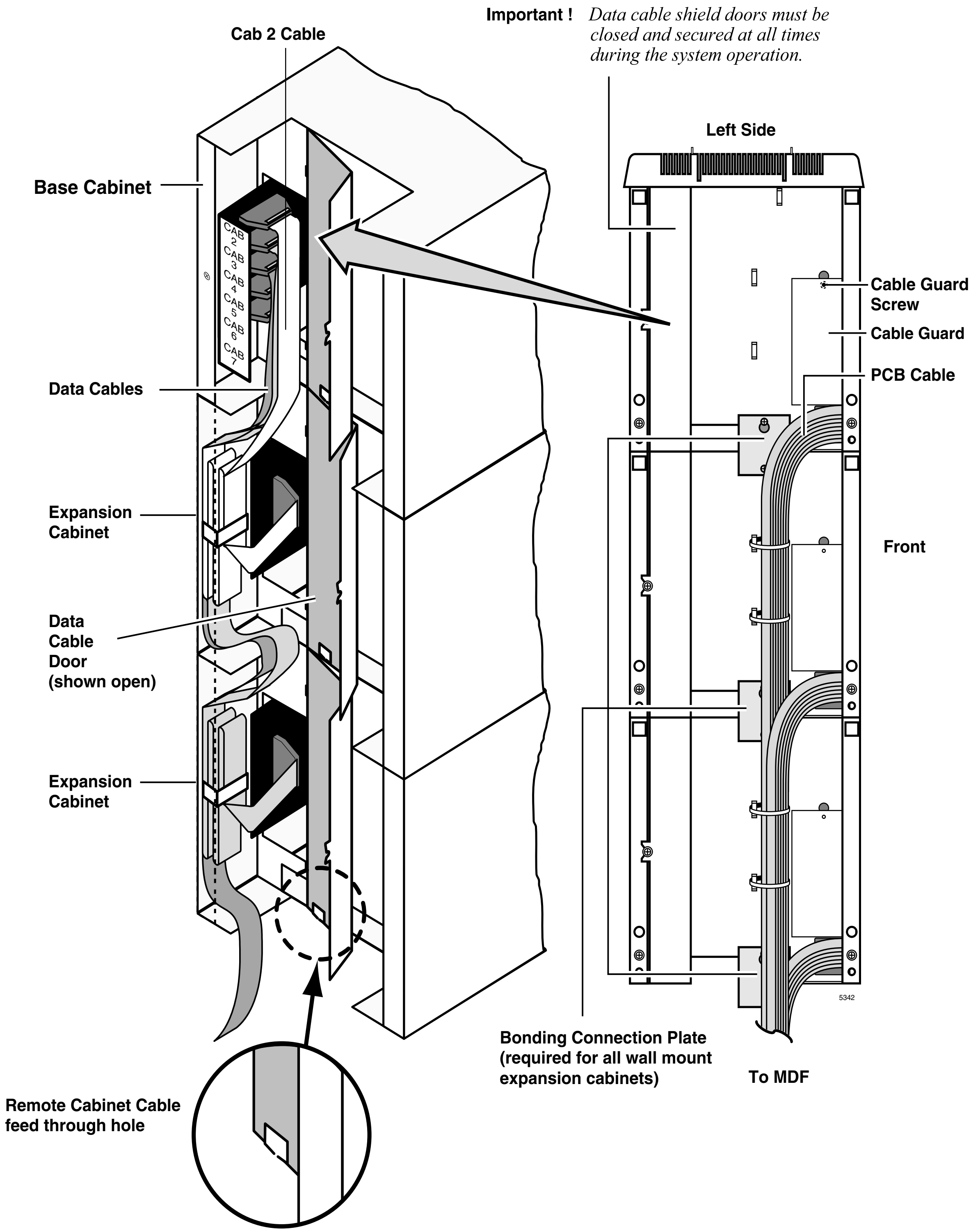


Figure 4-9 Data Cables Shown in Cabinet Interior—Side View

2. Wrap the cables in with the mesh tie. The purpose of the wrap is to shield the cables from EMI/ RFI effects. See Figure 4-10.

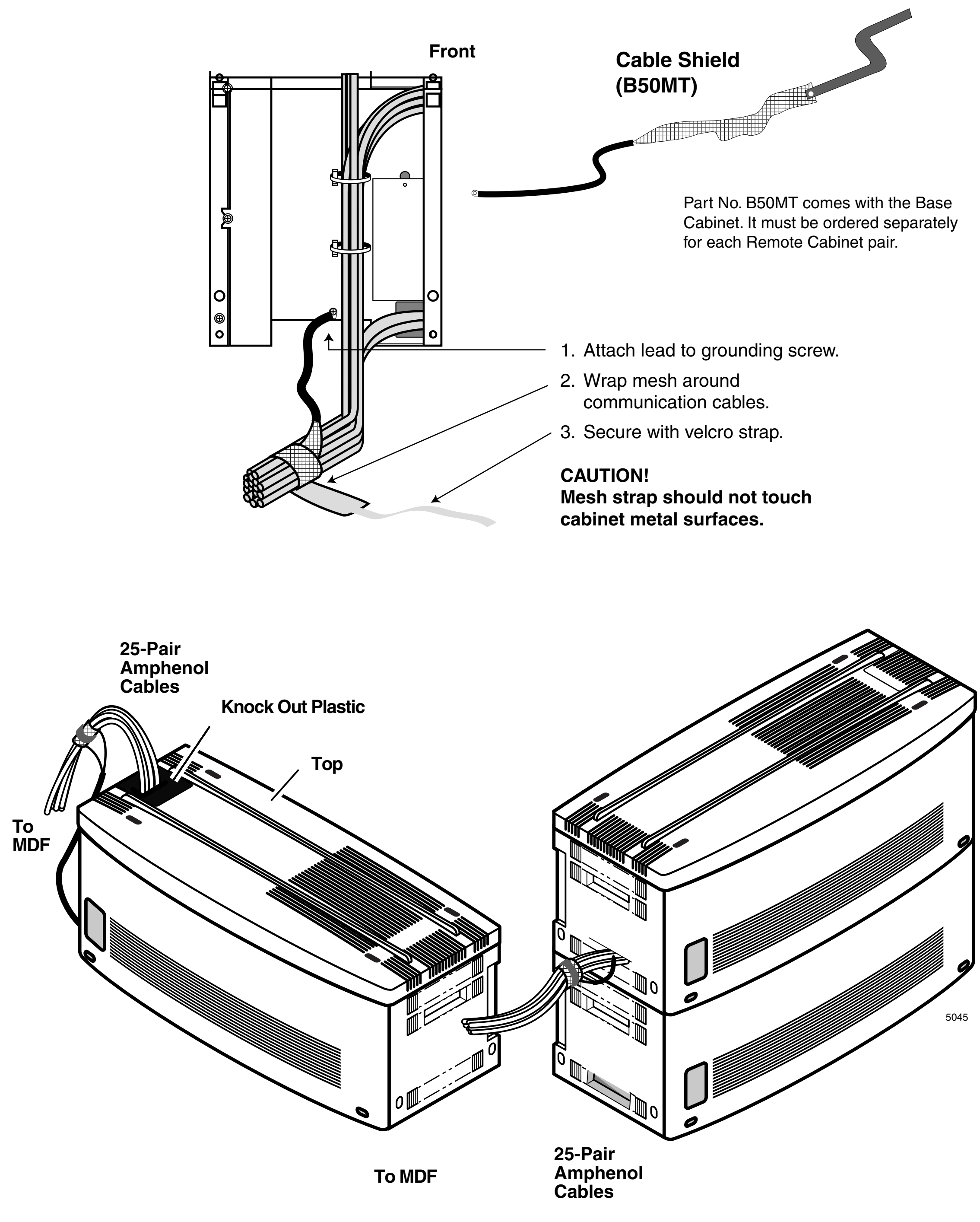


Figure 4-10 Cabinet Amphenol Cables

Step 4: Ground the System

The system requires a solid earth ground for proper operation and safety. The AC power cord(s) already contains a conductor for the “third wire ground” provided by the commercial power outlet (see Figure 4-11, for grounding points “A” and “B”). An insulated conductor must connect the frame ground terminal on the Base Cabinet to a cold water pipe or the building ground (point “B”).

Before connecting the system to the AC power source, measure the impedance of the building ground reference. If the ground path connected to the system has an impedance of 1 ohm or more, a better ground must be installed. In Figure 4-11, the grounding path between point “A” and the single point ground “B” must be less than 0.25 ohms.

The “third wire ground” coming from the primary AC power outlet must be dedicated and must be routed through the same conduit as the phase conductors serving the system. The conductor connected to the frame ground (FG screw) on the system power supply must be insulated and comply with the general rules for grounding contained in Article 250 of the National Electrical Code, NFPA 70, but must not depend on the cord and plug of the system.

If the CTX670 system consists of more than one cabinet, you must install the bonding connection plates that come attached to each expansion cabinet. Refer to Figure 4-9. Connect the mother board ground wires and the intercabinet ground wires per Figure 4-11.

Wrap the cable mesh shield (part No. B50MT) around the 25-pair communication cables that carry stations over tip and ring, per Figure 4-10.

WARNING!	**Failure to provide a proper ground may be a safety hazard to service personnel or lead to confusing trouble symptoms. In extreme cases, system failure may result because the system is not properly protected from lighting or power transients.**

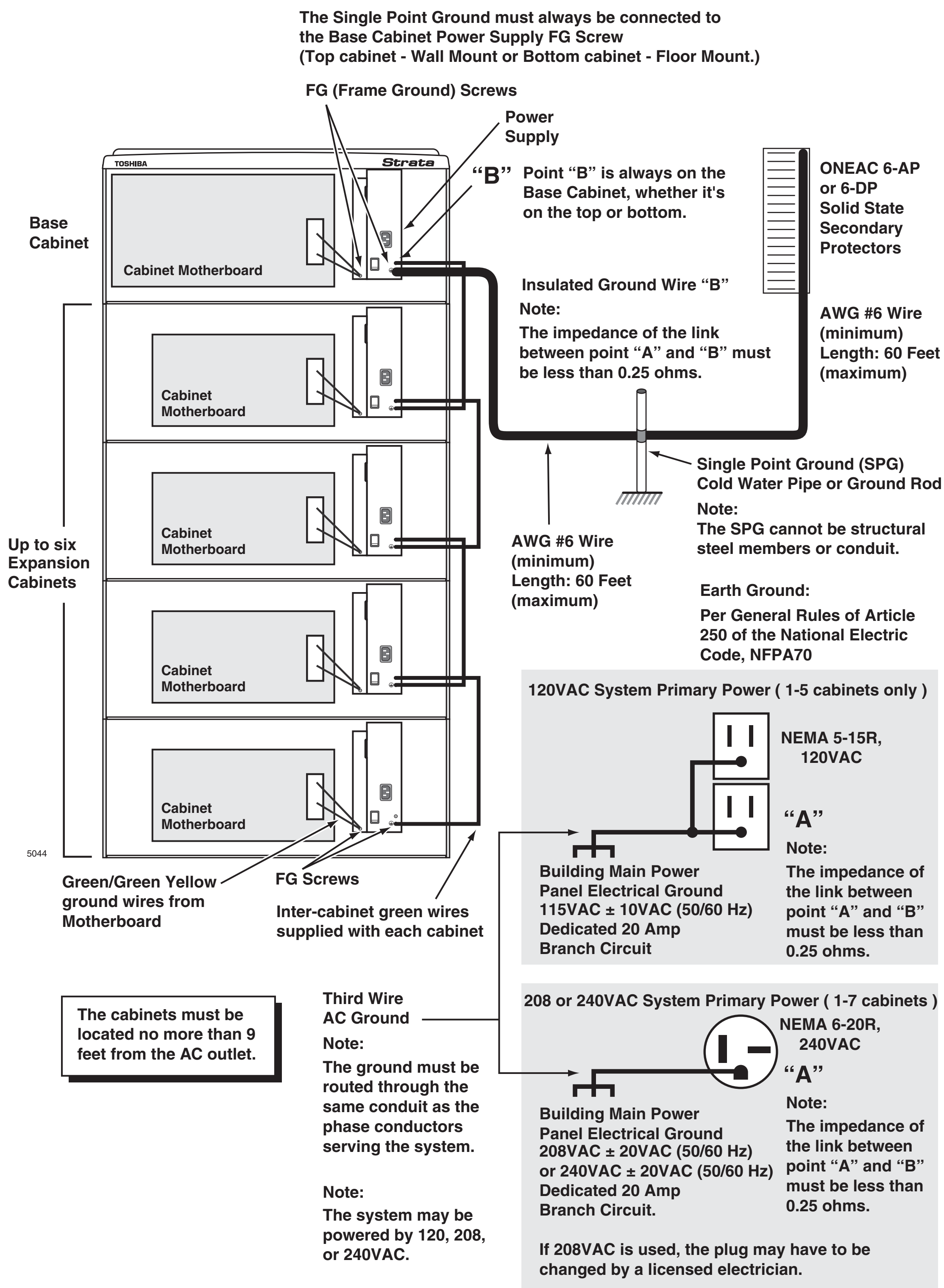


Figure 4-11 Cabinet Grounding

Step 5: Install AC Power Components

AC Power Requirements

The Strata CTX670 requires a single-phase, 50/60 cycles power source of 120, 208, or 240VAC, on a dedicated 20 ampere circuit breaker. 208VAC or 240VAC is required for six or seven cabinet systems.

The CTX670 power supply, BPSU672, automatically detects and adjusts for the type of AC voltage (120/208/240) to which it is connected.

Toshiba recommends that a dedicated AC service panel be used for the CTX670. AC outlets must be dedicated to CTX670 use, fused, and grounded. Equipment unrelated to the CTX670 must not be connected to the circuit or service panel dedicated to the CTX670.

Note It may not always be possible to power a complete CTX670 from a single circuit breaker panel. For example, in the case where a cabinet is remotely located.

To avoid accidental turn-off, do not configure the outlet serving the CTX670 with an On/Off switch. AC outlets serving the cabinets must be close enough so that the power cord from the cabinet power supply or power strip can reach the outlet (these power cords are nine ft.).

AC wall outlets for the CTX670 must be on dedicated 20amp breakers. AC outlets must meet National Electrical codes specifications: NEMA 5-20R for 120VAC or NEMA 6-20R for 208VAC/240VAC.

AC power cabling requirements vary, depending on: The method of cabinet installation (floor or wall mount), AC power source voltage (120VAC, 208VAC or 240VAC) and the number of cabinets. Requirements for distribution of AC power within the cabinets of the CTX670 are as described in Cabinet AC Power Distribution section.

Cabinet AC Power Component Description

The table shown below identifies the cabinet parts required to distribute AC power within the Strata CTX670 cabinets.

Table 4-1 Power Cabinet Hardware

<table>
<tr><th>Option</th><th>Description</th></tr>
<tr><td>RPSB2</td><td>Cabinet power strip for 120VAC primary power – provides three standard 120VAC/15A outlets (NEMA 5-15R) and nine ft. AC power cord with standard 120VAC/15A plug (NEMA 5-15P). This unit is field installed inside system cabinet side panels. The system can use 12 amps. (max.). See Figures 4-12~4-17.
One RPSB2 is required for two or three cabinet systems if the local electric code allows only one AC power cord to be connected to the system.
Note If the local electric code allows only one AC power cord to be connected to the system, 208VAC or 240VAC must be used as primary AC power for systems with four or more cabinets.
One RPSB2 is required for a three or four cabinet system if the local electric code allows two AC power cords connected to the system.
Two RPSB2s are required for a five cabinet system if the local electric code allows two AC power cords connected to the system.</td></tr>
<tr><td>BPSB240</td><td>Cabinet power strip for 208VAC or 240VAC primary power. Provides three 240VAC/20A outlets (NEMA 6-20R) and nine ft. AC power cord with a standard 240VAC/20A plug (NEMA 6-20P). This unit is field installed inside system cabinet side panels. The cord is rated at 16 amps. (max.). See Figures 4-14~4-17.
One BPSB240 is required for two or three cabinet systems.
Two BPSB240s are required for four or five cabinet systems.
Three BPSB240s are required for six or seven cabinet systems.
Note
• Local electric codes allow only one AC power cord to be connected to the system when using 208VAC or 240VAC as the primary AC power.
• If using 208VAC as primary power, the plug on the BPSB240 AC power cord (NEMA 6-20P) may have to be changed by a certified electrician depending on local electric codes.</td></tr>
<tr><td>BACL240</td><td>AC208V or AC240VAC nine ft., 10 amps. (max.), power supply cord. This cord must be used when the system is powered by 208VAC or 240VAC. One cord is required for each cabinet power supply and must be ordered separately only if using 208VAC or 240VAC as the system primary AC power.
Note The cord conforms with a National Electric Code standard plug (NEMA 6-20P) 208VAC/240VAC. The power strip plug that exits the system may have to be changed to a twist-lock type by a certified electrician to conform with local electric codes.</td></tr>
</table>

AC/Reserve Power and Data Cabling Overview

Figures 4-12 and 4-13 show an overview of the AC power and data cabling for the CTX670. Detailed illustrations of AC power strips and cords are on the following pages.

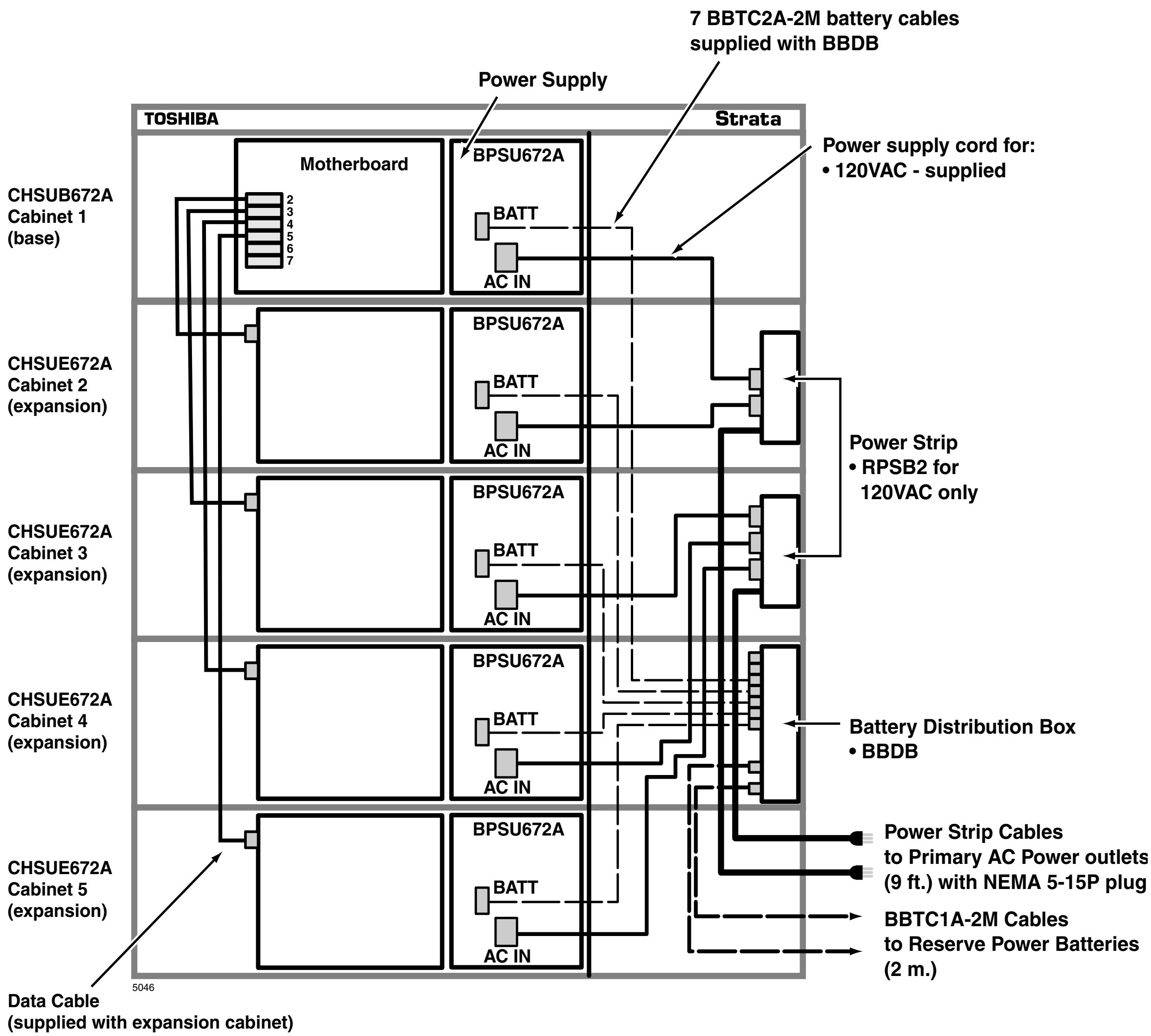


Figure 4-12 120VAC Power/Data Cabling for up to Five Cabinets

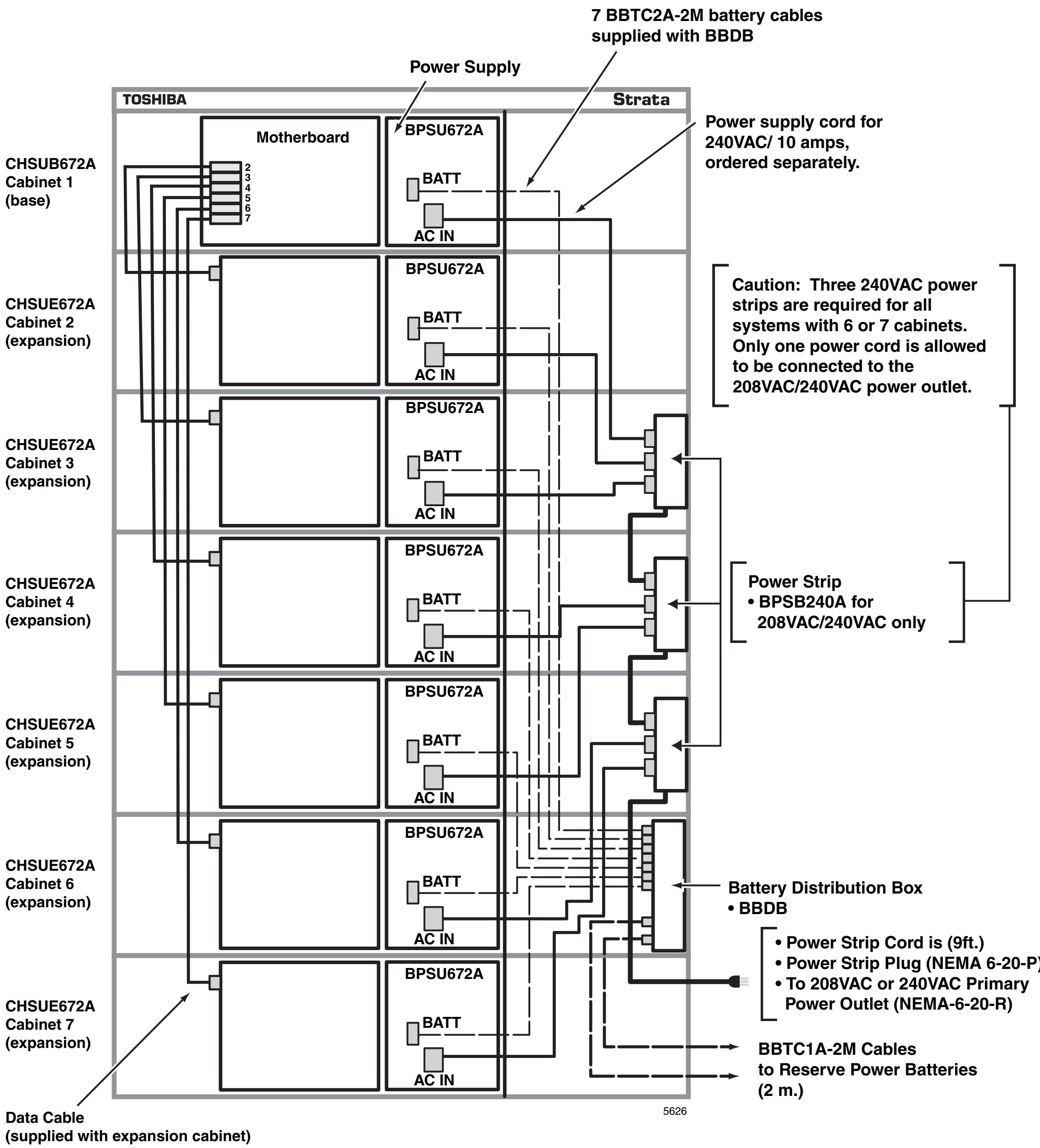


Figure 4-13 208VAC/240VAC Power/Data Cabling for up to Seven Cabinets

Cabinet AC Power Considerations

The CTX670 power supply works with either 120VAC, 208VAC or 240VAC. CTX670 only requires 120VAC (up to three cabinets if one AC cord is allowed or five cabinets if two AC cords are allowed – see below).

If the system has more then five cabinets, 208VAC or 240AVC is required for the primary AC power source. 208VAC or 240VAC can always be optionally used for systems with five or less cabinets for future growth or, if the electrical code requires.

To determine AC power requirements, you need to check local electrical code requirements for 120VAC, 208VAC or 240VAC primary power. Some electrical codes stipulate that:

- 208VAC or 240VAC is required for telephones systems
- Only one electrical cord can connect to the telephone system.
- Only two electrical cords can connect to the telephone system.
- No electrical cord can connect to the telephone system – must use conduit wiring installed by a certified electrician (example: when system is floor mounted).

Cabinet AC Power Component Requirements for Wall Mounted Systems

Tables 4-2 and 4-3 show the cabinet parts required to distribute AC power for various configurations of the CTX670 cabinets. Figures 4-14~4-17 show how to install these parts.

Table 4-2 Wall Mount Cabinet Power Component Requirements for 120VAC Primary Power

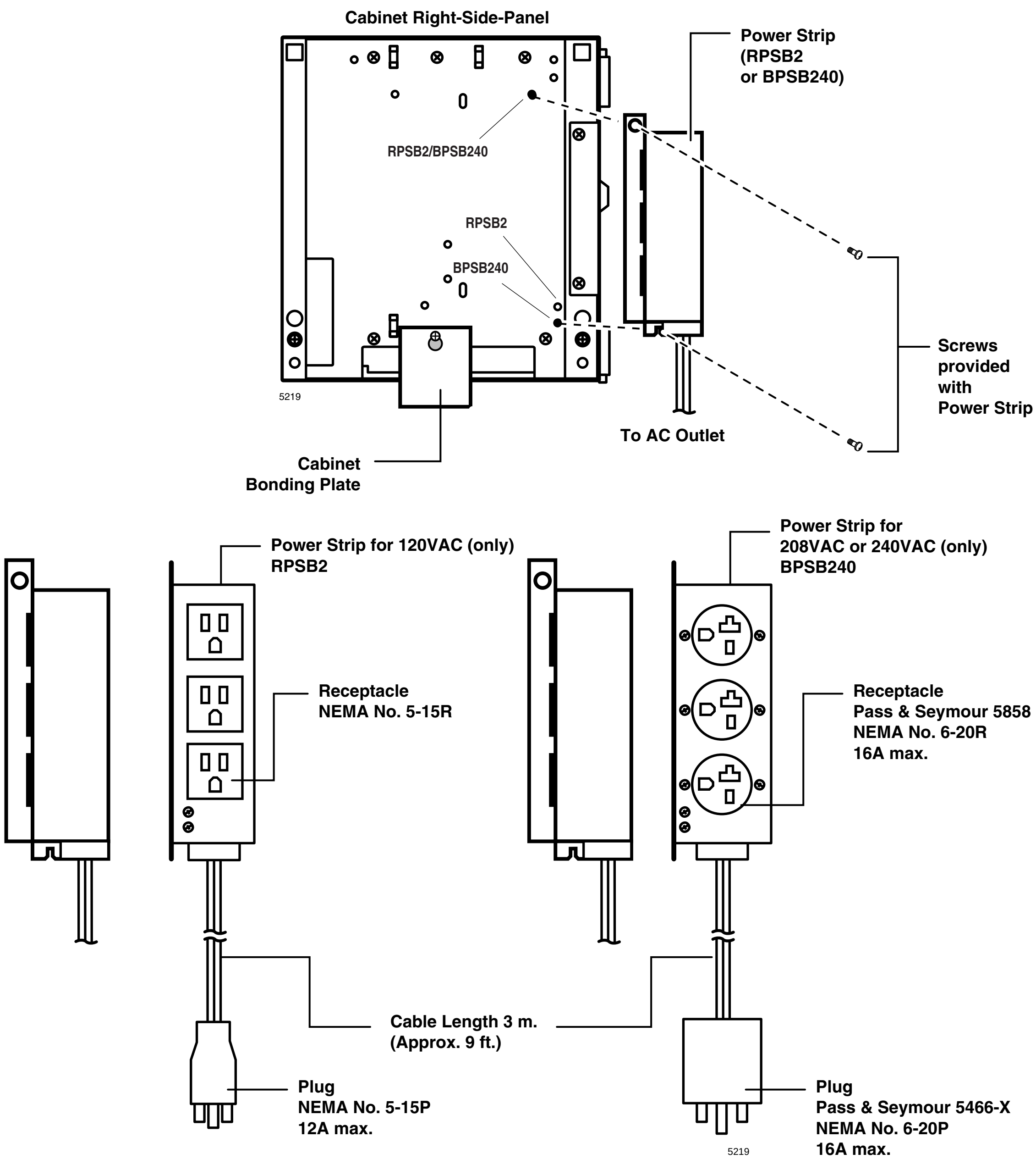
Local Electrical Code	Cabinets						
	1	2	3	4	5	6	7
Allows only one 120VAC power cord from system	0 RPSB2	1 RPSB2	1 RPSB2	N/A	N/A	N/A	N/A
Allows two 120VAC power cords from system	0 RPSB2	0 RPSB2	1 RPSB2	1 RPSB2	2 RPSB2	N/A	N/A

- One dedicated, isolated, 20 amp. AC circuit breaker with dual outlets is required.
- N/A= If the system contains more than three cabinets and if the local code allows only one AC cord, the system requires a BCCB120 conduit box wired by a certified electrician when using 120VAC as primary power. Otherwise, 208VAC or 240VAC should be used as the primary power source (see cabinet power options listed below).

Table 4-3 Wall Mount Cabinet Power Component Requirements for 208VAC or 240VAC Primary Power

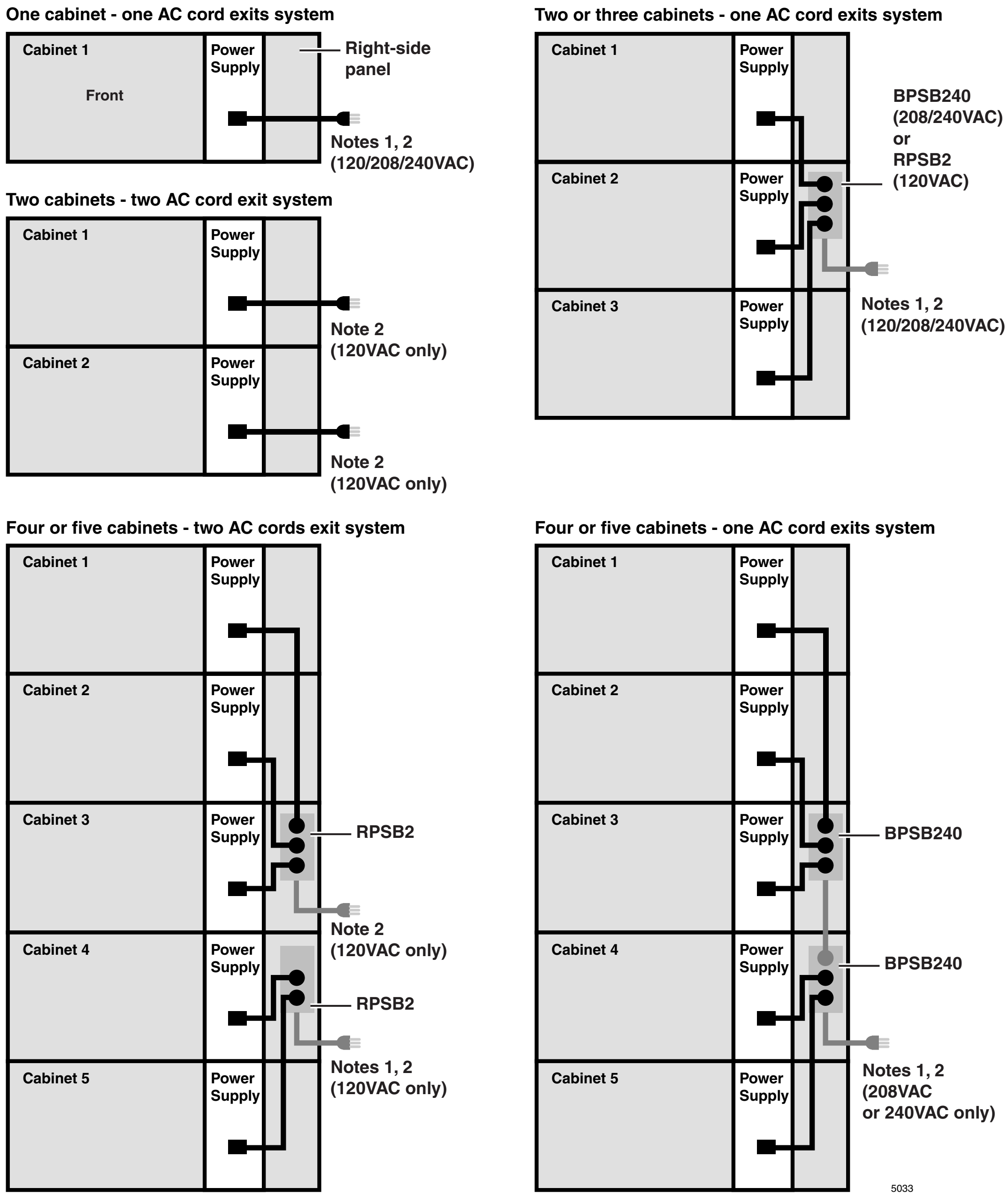
Local Electrical Code	Cabinets						
	1	2	3	4	5	6	7
Allows One AC power cord from system	1 BACL240	1 BPSB240 2 BACL240	1 BPSB240 3 BACL240	2 BPSB240 4 BACL240	2 BPSB240 5 BACL240	3 BPSB240 6 BACL240	3 BPSB240 7 BACL240

Important! *The plugs and wall receptacles required by the local electrical code might differ for 208VAC and 240VAC. Thus in some areas of the U.S., the plug used on the Toshiba 240VAC power strip and 240VAC power supply cord (NEMA code 6-20P) can not be used for 208VAC installations. In this case, when using 208VAC, the AC plugs on the BPSB240 power strip cord that connects directly to the 208VAC wall outlet must be changed by a certified electrician per the local electrical code.*



WARNING! To prevent serious injury, always mount power strips with provided screws before inserting plug into AC power.

Figure 4-14 AC Power Strip Installation



Notes

1. 120VAC cord is supplied with cabinet. A special cord, BACL240, must be ordered for each cabinet if 208VAC or 240VAC is used.
2. Power Strips must plug into the following AC outlets: 120VAC to NEMA 5-15R, and 208/240VAC to NEMA 6-20R.

Figure 4-15 AC Power Cords for One to Five Cabinets

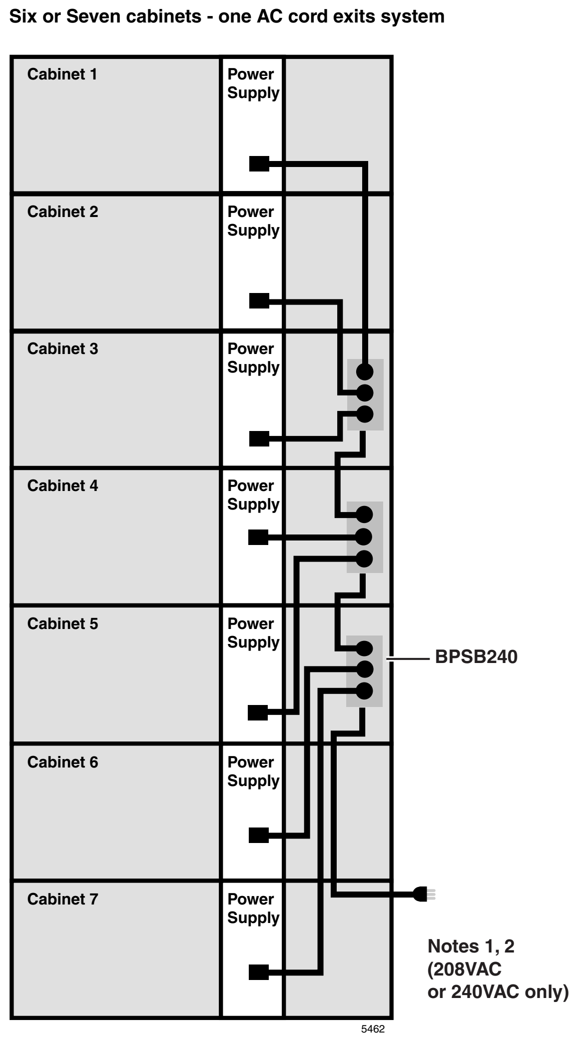
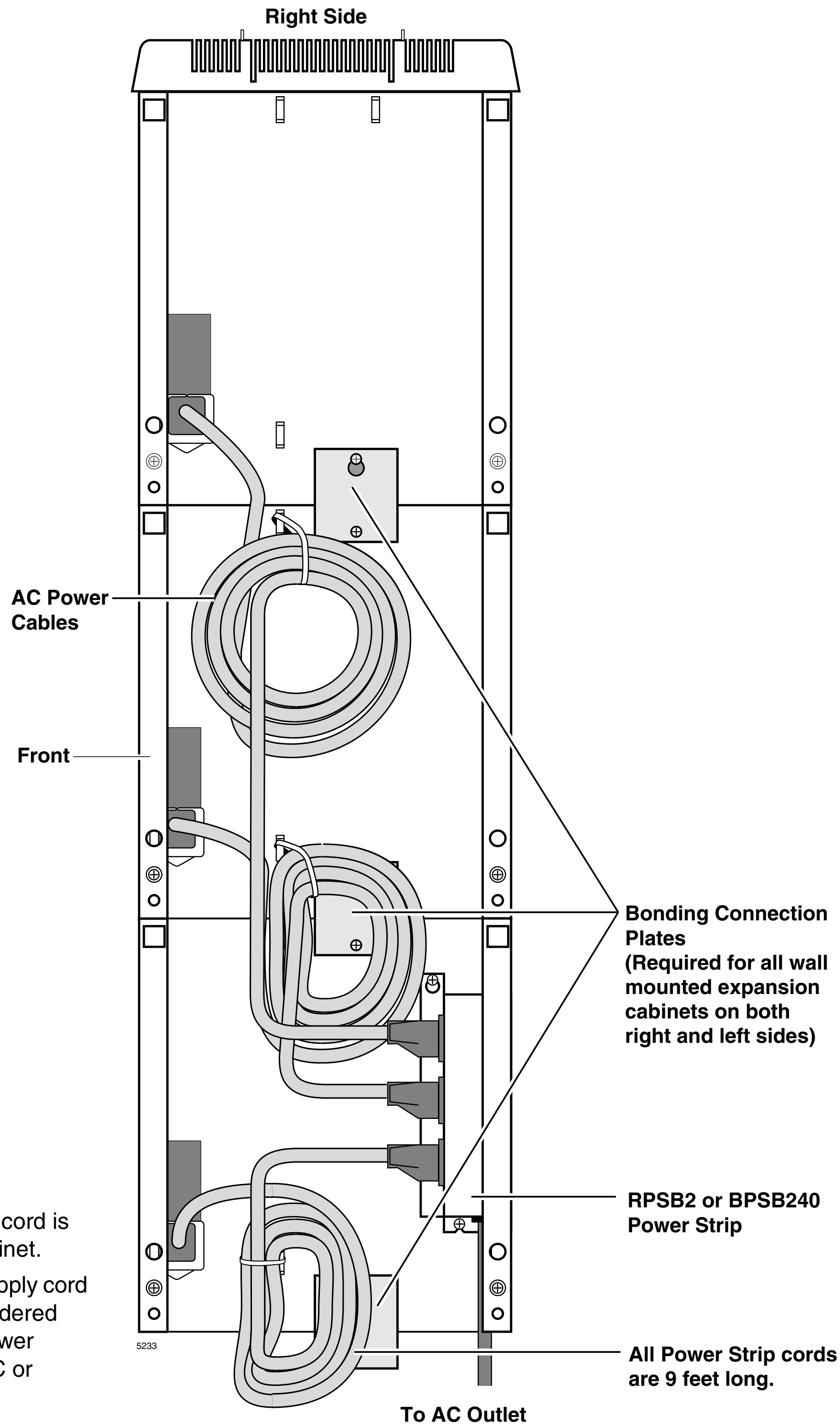


Figure 4-16 AC Power Cords in Six or Seven Cabinets



120VAC power supply cord is shipped with each cabinet.

A special AC power supply cord (BACL240) must be ordered separately for each power supply if using 208VAC or 240VAC power.

Figure 4-17 AC Power Strips in Cabinet Interior

Step 6: Install Reserve Power

Two or four customer-supplied, 12VDC batteries (80 amp hours maximum) can be connected to the system as a power failure backup. In the event of a power failure, the system automatically switches over to battery power without any interruption to existing calls or other normal system functions.

Important! *Batteries must be connected when normal AC power is available; they cannot be connected during an AC power failure situation.*

The length of time reserve power operates depends on the system, size and number of batteries provided, and the system load. Typical reserve power duration estimates and battery specifications are estimated with the following considerations (see Table 4-4):

- Batteries have full charge at start of operation.
- Two or four batteries connected per Figure 4-18.
- Batteries are 12VDC, rated at 80 amp/hours each.
- System is operating at full load traffic with LCD phones.
- Batteries used for this test are gel-cell and maintenance-free. Reserve duration will vary depending upon battery type, age, and manufacturer. These figures should only be used as an estimate.

Table 4-4 Typical Reserve Power Duration Estimate

Number of Cabinets	1	2	3	4	5	6	7
Estimated operation time Two-battery configuration	12.0 hrs.	6.0 hrs.	4.0 hrs.	3.0 hrs.	2.5 hrs.	2.0 hrs	1.8 hrs
Estimated operation time Four-battery configuration	24.0 hrs.	12.0 hrs	8.0 hrs	6.0 hrs.	5.0 hrs.	4.0 hrs	3.5 hrs

WARNING! Some batteries can generate explosive gases. Therefore, ensure that batteries are located in a well-ventilated area.

Do not smoke near batteries.

Avoid creating any electrical sparks near batteries.

Use commercially available battery enclosures to reduce risk to nearby people and equipment.

The procedure for installing reserve power varies, depending on the number of cabinets in the system and the mounting method employed in installing the cabinets. The following text details reserve power battery installation requirements.

WARNING! Battery cables that exit the cabinet(s) are not UL listed because of possible incorrect installations. Have a licensed electrician install these cables.

Reserve Battery Cabinet Components/Cables

The part names and descriptions of the reserve battery cabinet components and cables are shown in Table 4-5.

Table 4-5 Reserve Battery Cabinet Components/Cables

Option	Description
PBTC-3M	A three-meter battery cable used to connect reserve power batteries to the system power supply when the system has less than three cabinets. One reserve power cable is required for each cabinet in a one or two cabinet system (wall or floor mount). The cable connects the CTX670 cabinet power supply directly to the battery terminals (a BBDB is not required).
BBDB	CTX670 reserve power battery distribution box is required when connecting reserve power batteries to three or more cabinets (wall or floor mount). The box is field installed into one of the CTX670 cabinet side panels. The BBDB provides seven BBTC2A-2.0M, battery distribution cables to connect reserve power from the BDDB box to each individual cabinet power supply. One or two BBTC1A-2.0M must be ordered separately when using the BBDB battery distribution box.
BBTC1A-2.0M	A two-meter battery cable used to connect reserve power batteries to the BBDB battery distribution box. One reserve power cable is required in a three or four cabinet system and two cables are required for five or more cabinet systems (wall or floor mount). The cable connects CTX670 BBDB box directly to the battery terminals.

Reserve Power for One or Two Cabinets (Wall Mount)

1. Connect the black jumper wire (supplied with the PBTC-3M cable) from the positive terminal of one 12VDC battery to the negative terminal of the second 12VDC battery (Figure 4-18).
2. Ensure that a serviceable 10-amp fuse is installed in the in-line fuse holder of the PBTC-3M cable.
3. Connect the PBTC-3M battery cable white lead to the open positive terminal of the 12VDC battery. Connect the black lead to the open negative terminal of the second 12VDC battery.

Important! *The cabinet(s) must be connected to the (live) AC power source, and the power supply On/Off switch set to On prior to the final step of connecting the reserve power batteries to the power supply via the BATT+/- receptacle. If the batteries are connected after AC power is lost, reserve power will not function.*

4. Connect the PBTC-3M battery cable two-prong male plug to the Base Cabinet power supply BATT +/- receptacle.
5. Repeat Steps 3 and 4 to connect a PBTC-3M to the Expansion Cabinet.
6. To test reserve power operation, disconnect system AC power plugs with power supply On/Off switches in the On position. The system should continue to operate without interruption.

Note If connecting four batteries, follow the wiring diagram in Figure 4-18.

Reserve Power for Three or More Cabinets (Wall Mount)

1. Install the Battery Distribution Box (BBDB) to the bottom cabinet (see Figures 4-12 and 4-24). The BCCB is not required for wall mount systems.
2. Connect two Cable "C" jumper wires from the positive terminal of one 12VDC battery to the negative terminal of the second 12VDC batter, per Figure 4-18 (Cable "C" is supplied with the BBTC1A-2.0M cable).
3. Ensure that a serviceable 15-amp fuse is installed in the in-line fuse holder of the BBTC1A-2.0M battery cable.
4. Connect the white lead of the BBTC1A-2.0M battery cable to the open positive terminal of the 12VDC battery. Connect the black lead to the open negative terminal of the second 12VDC battery.
5. Connect a second BBTC1A-2.0M in parallel to the first BBTC1A-2.0M cable per Steps 2, 3 and 4 instructions.
6. Plug the two BBTC1A-2.0M battery cables into the Battery Distribution Box.

Important! *The cabinets must be connected to the (live) AC power source, and the power supply On/Off switches set to On prior to the final step of connecting the reserve power batteries to the power supplies via the BATT +/- receptacle. If the batteries are connected after AC power is lost, reserve power will not function.*

7. Connect the BBTC2A-2.0M cables from the Battery Distribution Box to the BATT +/- receptacle of individual power supplies per Figure 4-12 (BBTC2A-2.0M cables are supplied with an BBDB distribution box).
8. To test reserve power operation, disconnect the system AC power plugs with the power supply On/Off switches in the On position. The system should continue to operate without interruption.

Note If connecting four batteries, follow the wiring diagrams in Figure 4-18.

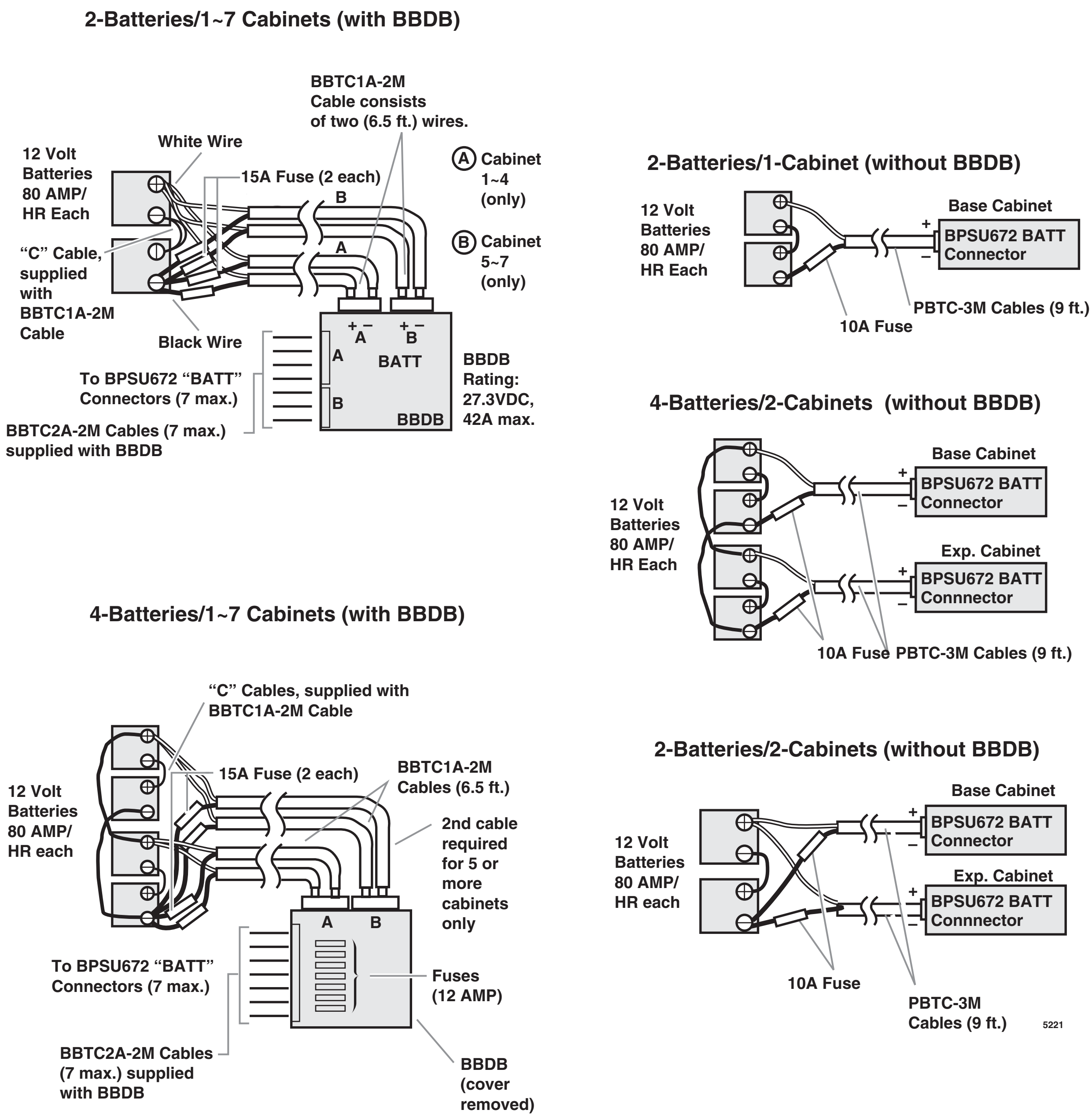


Figure 4-18 Battery Wiring Diagram (Two or Four Batteries) Wall Mount Only

Cabinet Floor Mounting

The part numbers and descriptions of the floor mounting hardware are shown in Table 4-6.

Table 4-6 Floor Mount Hardware

Option	Description
BCCB120 or BCCB240	CTX670 conduit connection box that is installed in the base cabinet, side panel. It is used to hardwire Primary AC power and reserve battery power connections through conduit. These boxes are required by UL for three or more floor mounted cabinets. Conduit boxes are not required for wall mounted systems with any number of cabinets or floor mounted system with one or two cabinets. They can be used as an option on any system. The BCCB120 is required when connecting AC120VAC as the primary power source and the BCCB240 is required when connecting AC208VAC or AC240VAC as the primary power source. BCCB conduit boxes must be field installed by a certified electrician.
BFIF	Floor mount fixture kit is required when floor mounting two or more CTX670 cabinets. Provides two metal stands for mounting any number of CTX670 cabinets on floor. Three pairs or wall brackets (RWBF) are supplied with BFIF to use when mounting three or more CTX670 cabinets on floor. The wall brackets are needed to secure floor-mounted systems to the wall for safety purposes.

Floor Mounting One or Two Cabinets

1. Remove front, side, and top covers from cabinet(s) (Figure 4-5). Remove plastic locating parts from all cabinet back covers using a Phillips screwdriver.
2. Make sure that cabinet power supplies (BPSU672A) are installed per “Install Power Supply” on page 4-6.
3. If installing just one or two cabinets, install the BFIF fixtures on each side of the bottom of the cabinet (Figure 4-19) and place the cabinet where it should be installed.
4. Set the bottom cabinet on the floor or mount surface, then set the top cabinet on the bottom cabinet.
5. Fasten the two cabinets together with the four screws provided: (two screws at front “A” and two at back “B” of cabinet. Place cabinet where it should be installed.
6. Connect the Expansion Cabinet data cable to the “CAB. 2” data cable connector on the Base Cabinet (Figures 4-9 and 4-12).

   ...or if installing a Remote Expansion Cabinet: see details in “Remote Cabinet Installation Instructions” on page 4-56.
7. Install ground wiring, AC and reserve power cabling, and PCB cabling per the “Recommended Installation Sequence” on page 4-6.
8. Fill out cabinet/slot identification labels on cabinet(s) (Figure 4-8).
9. Reinstall covers on to cabinets (Figure 4-5).

Floor Mounting Three or More Cabinets

This section shows you how to mount three or more cabinets to a concrete, wood or computer room floor. Use the General Steps for all of these methods first, then the specific steps that follow for each method.

1. Make sure that cabinet power supplies (BPSU672A) are installed per "Install Power Supply" on page 4-6.
2. Remove front, side, and top covers from all cabinets. Remove plastic locating parts from all cabinet back covers using Phillips screwdriver (Figures 4-4 and 4-5).
3. Install a floor fixture (BFIF) on each side of the bottom cabinet. (Make sure that the fixture is inside of the cabinet edge. For Steps 3~10, see Figures 4-19~4-23.
4. Place cabinet two on top of the bottom cabinet and connect them together at points "A" and "B" with the screws provided.
5. Place cabinet three on top of cabinet two and connect them together at points "A" and "B" with the screws provided.
6. If installing more than three cabinets, install wall brackets (RWBF) on the top of cabinet three. Position the three cabinets parallel to the wall (two inches from the wall) and secure the wall brackets to the wall with customer-provided wood screws and wall anchors as required.
7. For systems with just three cabinets, secure the floor fixtures (already attached to the bottom cabinet) to the floor with the customer-provided floor bolts.
8. Refer to the sub-sections that follow the appropriate procedure to anchor the system to concrete, wood, or computer room floor.
9. Add remaining cabinets, making sure that the cabinets are connected together at points A and B with the screws provided.
10. For systems with four or more cabinets, make sure that wall brackets (RWBF) are installed on both sides of the top cabinet, in addition to cabinet three.
11. Check to make sure the cabinets are parallel to the wall. Secure the floor fixtures attached to the bottom cabinet to the floor with the customer-provided floor anchors.
12. Connect the data cable of each Expansion Cabinet to the applicable data cable connector on the Base Cabinet (Figure 4-9). (The data cable from the first Expansion Cabinet should be connected to the connector labeled "CAB. 2", the cable from the second Expansion Cabinet to the "CAB. 3" connector, etc.)
13. Install ground wiring, AC and reserve power cabling, and PCB cabling per the "Recommended Installation Sequence" on page 4-6.
14. Fill out cabinet/slot identification labels on each cabinet and reinstall covers on the cabinets. (The top cover should be installed on the top cabinet.)

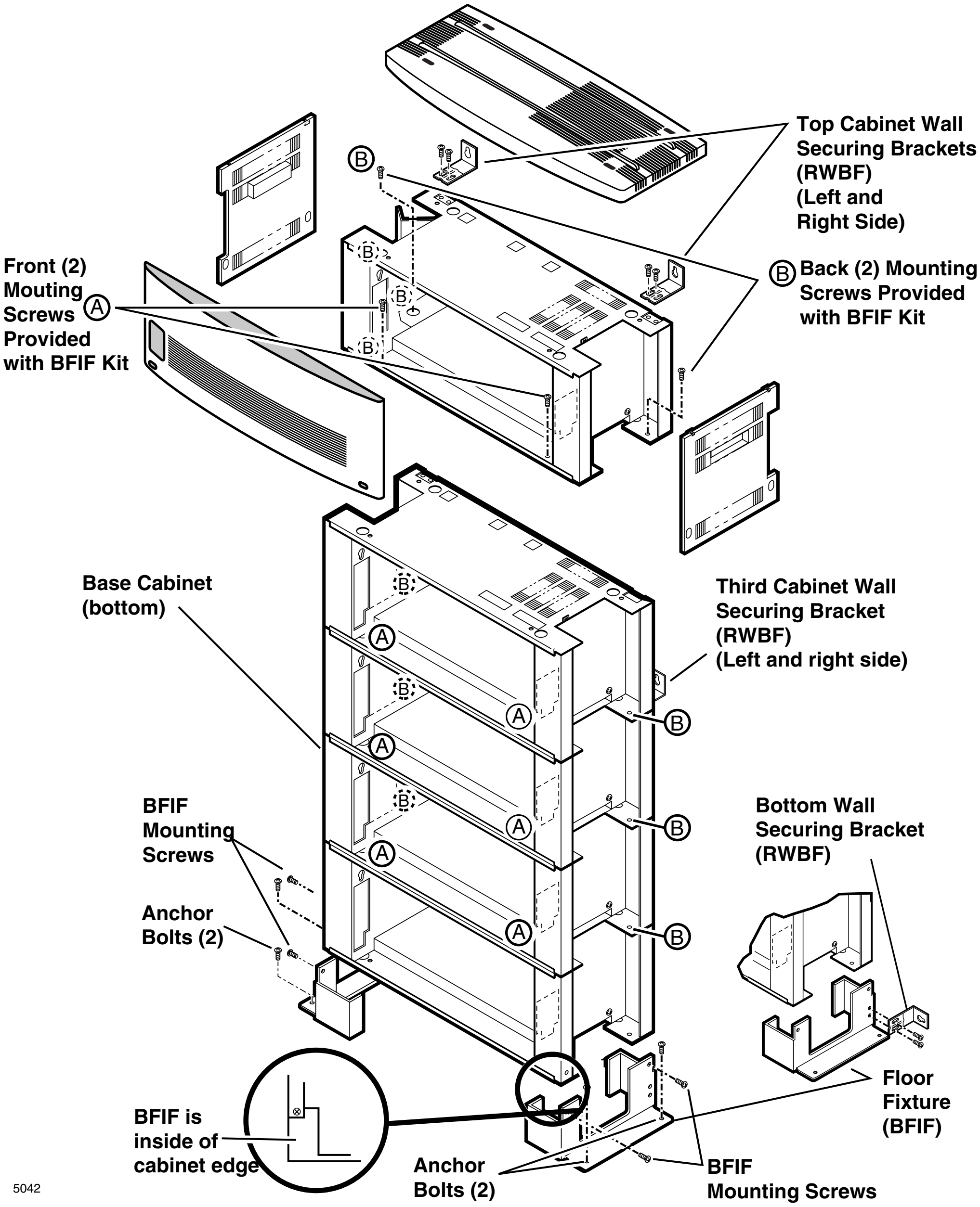
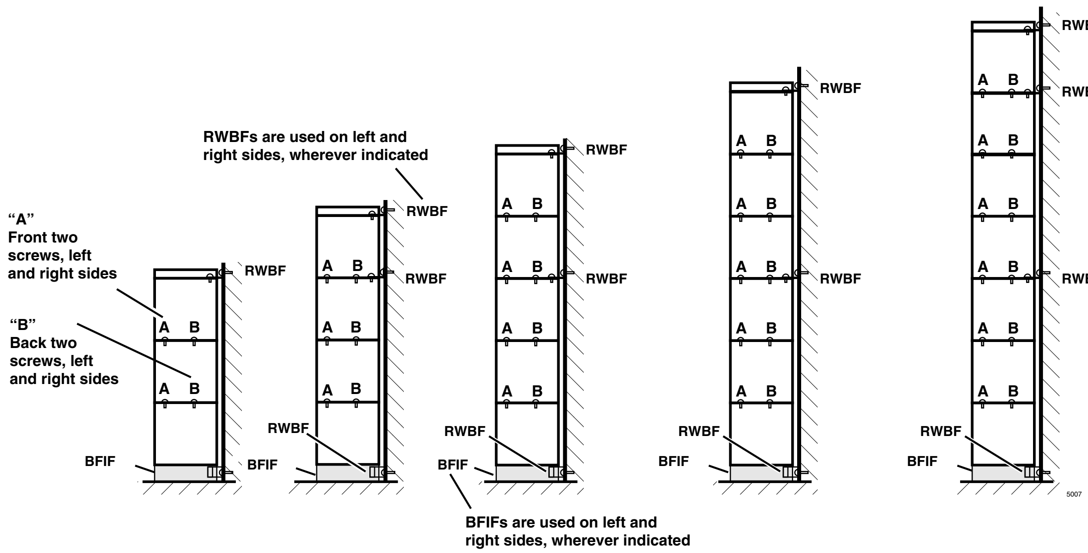


Figure 4-19 CTX670 Cabinet Floor Installation

Important!

- *BFIF (two-each) and RWBFA (six-each) are supplied with the floor installation kit BFIF.*
- *Upper and third cabinets must be fixed to the wall with RWBFS on each side (use #12 x 2 inch wood screws and wall anchors, as required).*
- *Floor fixture (BFIF) must be fixed to floor by either anchor bolts, or wall by RWBF wall brackets (see Figures 4-19 and 4-20).*
- *Screw size for BFIF and A and B cabinet screws are metric M5 x 10, .80 pitch.*



Note RWBF (3-pairs) and BFIF Stands (1-pair) are supplied with floor installation kit BFIF.

Figure 4-20 Floor Mounting Cabinet Installation

Bolt Cabinets to Concrete Floor

1. Mount the CTX670 Base Cabinet on Floor Mount Fixtures (see Figures 4-19 and 4-21). Position the Base Cabinet at the selected installation location.
2. Mark the floor where holes will be drilled. Move the Base Cabinet prior to drilling.

Note Cover the Base Cabinet with a drop cloth to protect the power equipment from dust created during drilling.

3. Use a hammer drill to make holes for 3/8-inch bolt anchors.
4. Install the bolt anchors, with plugs, in the drilled holes.
5. Using the driving tool and a hammer, drive each bolt anchor into the floor.
6. Move the Base Cabinet into position on the equipment room floor.
7. Secure the Base Cabinet to the floor using bolts, lock washers, and flat washers.

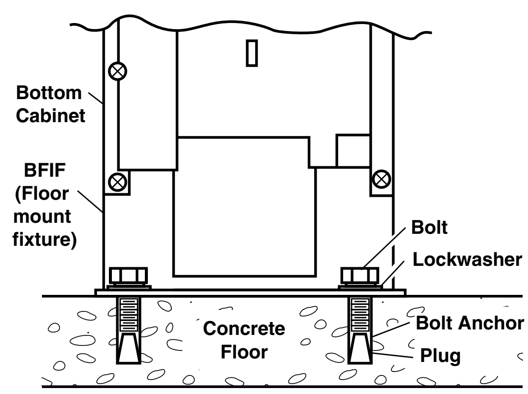


Figure 4-21 Installation on Concrete Floor

Bolt Cabinets to Wooden Floor

1. Mount the CTX670 Base Cabinet on Floor Mount Fixtures (BFIF). See Figures 4-19 and 4-20.
2. Position the Base Cabinet at the selected installation location.
3. Mark the floor where holes will be drilled. Move the Base Cabinet prior to drilling.

Note Cover the Base Cabinet with a drop cloth to protect the power equipment from dust created during drilling.

4. Drill pilot holes to make insertion of 3/8 inch lag bolts easier, and to prevent splitting of wood flooring.
5. Move the Base Cabinet into position on the equipment room floor.
6. Secure the Base Cabinet to the floor using lag bolts, lock washers, and flat washers.

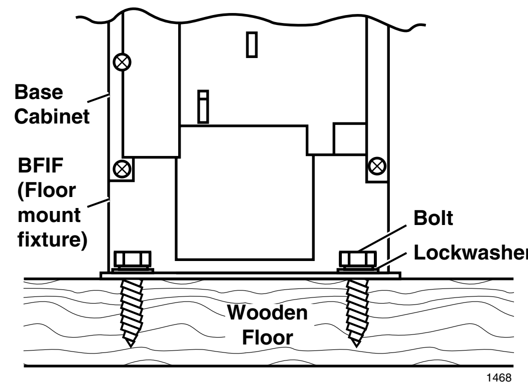


Figure 4-22 Installation on Wooden Floor

Bolt Cabinets to Computer Room Floor

1. Mount the CTX670 Base Cabinet on Floor Mount Fixtures (BIMF). See Figures 4-19 and 4-20.
2. Position the Base Cabinet at the selected installation location.
3. Mark the floor where holes will be drilled. Move the Base Cabinet prior to drilling.

Note Cover the Base Cabinet with a drop cloth to protect the power equipment from dust created during drilling.

4. Drill holes through tile for 3/8-inch threaded rods.
5. After the tiles have been drilled, insert threaded rods through the holes in the tile and mark the concrete floor directly beneath the holes in the tiles.
6. Remove the tiles. Use a hammer drill to make holes for 3/8-inch bolt anchors.
7. Install the bolt anchors with plugs in the drilled holes.
8. Using the driving tool and a hammer, drive each bolt anchor into the floor.
9. Screw threaded rods into each bolt anchor.
10. Install a hex nut, lock washer, and flat washer on each threaded rod. Screw the nuts down far enough to allow floor tiles to be replaced over the threaded rods.
11. Replace tiles over threaded rods in their original positions on the floor.
12. Reach under the tiles, and screw the hex nuts upward until the flat washers are touching the bottom of the tile.
13. Use a hack saw to cut the threaded rods at a height of approximately 1.5 inches above the floor tile.
14. Move the Base Cabinet into position over the threaded rods.

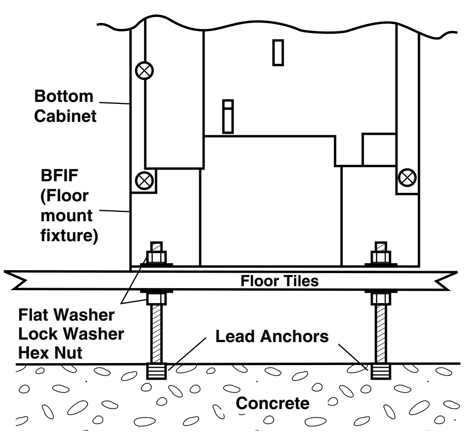


Figure 4-23 Installation on Computer Room

Strata CTX670 Installation

15. Secure the Base Cabinet to the floor using flat washers, lock washer, and hex nuts on each threaded rod.Mount Cabinets to Computer Room Floor (Unbolted).
16. Make sure that cabinet power supplies (BPSU672A) are installed per “Install Power Supply” on page 4-6.
17. Remove front, side, and top covers from all cabinets (Figure 4-5).

Note As shown in Figure 4-5, the two screws on each side cover and the three screws on the front cover (the bottom left screw must be completely removed) should only be loosened and the covers slid to the right for removal.

18. Remove plastic locating parts from all cabinet back covers using a Phillips screwdriver (Figure 4-4).
19. Install a floor fixture (BFIF) on each side of the bottom cabinet (Figures 4-19 and 4-23), making sure that the fixture is inside of the cabinet edge.
20. Secure a wall bracket (RWBF) to both floor fixtures with the screws provided. Secure the wall brackets to the wall with customer-provided wood screws and wall anchors.
21. Place a cabinet on top of the bottom cabinet and connect the cabinets together at points “A” and “B”17 with the screws provided.
22. Install wall brackets (RWBF) on the top of cabinet three and secure them to the wall with customer-provided wood screws and wall anchors.
23. Add remaining cabinets, making sure that the cabinets are connected together at points A and B with screws provided.
24. For systems with four or more cabinets, make sure that wall brackets (RWBF) are installed on both sides of the top cabinet, in addition to cabinet three.
25. Connect the data cable of each Expansion Cabinet to the applicable data cable connector on the Base Cabinet (Figures 4-9 and 4-12). The data cable from the first Expansion Cabinet should be connected to the connector labeled “CAB. 2”, the cable from the second Expansion Cabinet to the “CAB. 3” connector, etc.).
26. Install ground wiring, AC and reserve power cabling, and PCB cabling per the “Recommended Installation Sequence” on page 4-6.
27. Fill out cabinet/slot identification labels on each cabinet (see Figure 4-8), then reinstall covers on the cabinets. (The top cover should be installed on the top cabinet.)

Cabinet AC Power Component Installation

After the cabinets have been floor mounted, the AC power components should be installed. Tables 4-7 and 4-8 show the primary AC power components required for floor mounted systems.

Table 4-7 Floor Mount Cabinet Component Requirements for 120VAC Primary Power

Local Electrical Code	Cabinets						
	1	2	3	4	5	6	7
Three or more cabinets require a conduit box	1 – BFIF	1 – BFIF	1 -BCCB120[1] 1 – BFIF	1 – BCCB120[1] 1 – RPSB2 1 – BFIF	1 – BCCB120[1] 2 – RPSB2 1 – BFIF	N/A	N/A

1. A BCCB120 conduit connection box must be installed and wired by a certified electrician per the local electrical code (see Figure 4-24).

Table 4-8 Floor Mount Cabinet Component Requirements for 208VAC or 240VAC Primary Power

Local Electrical Code	Cabinets						
	1	2	3	4	5	6	7
Two or more cabinets require a conduit box	1 – BACL240 1 – BFIF	1 – BCCB240[1] 2 – BACL240 1 – BFIF	1 – BCCB240[1] 1 – BPSB240 3 – BACL240 1 – BFIF	1 – BCCB240[1] 1 – BPSB240 4 – BACL240 1 – BFIF	1 – BCCB240[1] 2 – BPSB240 5 – BACL240 1 – BFIF	1 – BCCB240[1] 2 – BPSB240 6 – BACL240 1 – BFIF	1 – BCCB240[1] 3 – BPSB240 7 – BACL240 1 – BFIF

1. A BCCB240 conduit connection box must be installed and wired by a certified electrician per the local electrical code (see Figure 4-25).

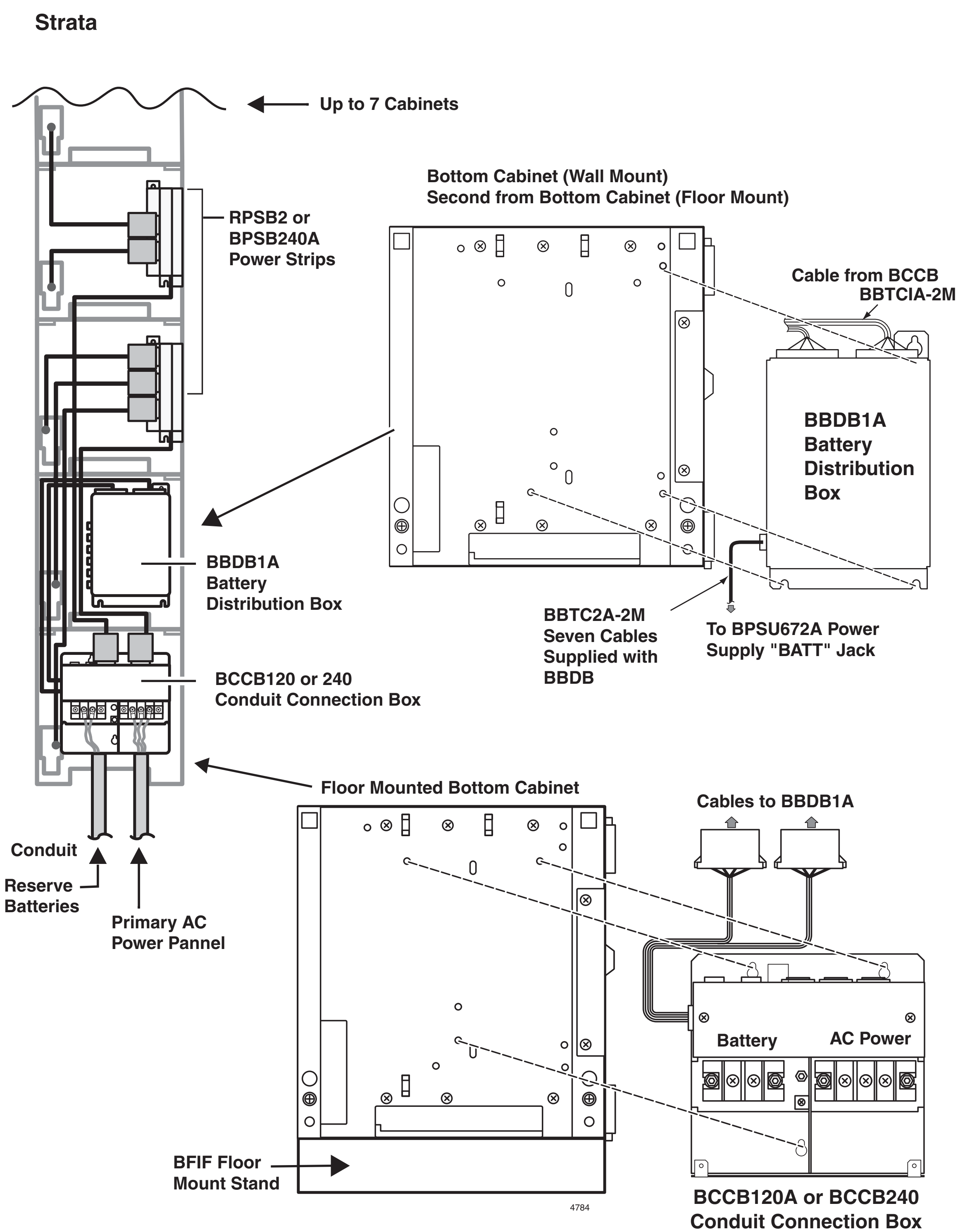


Figure 4-24 Battery Distribution and Conduit Connection Box Installation

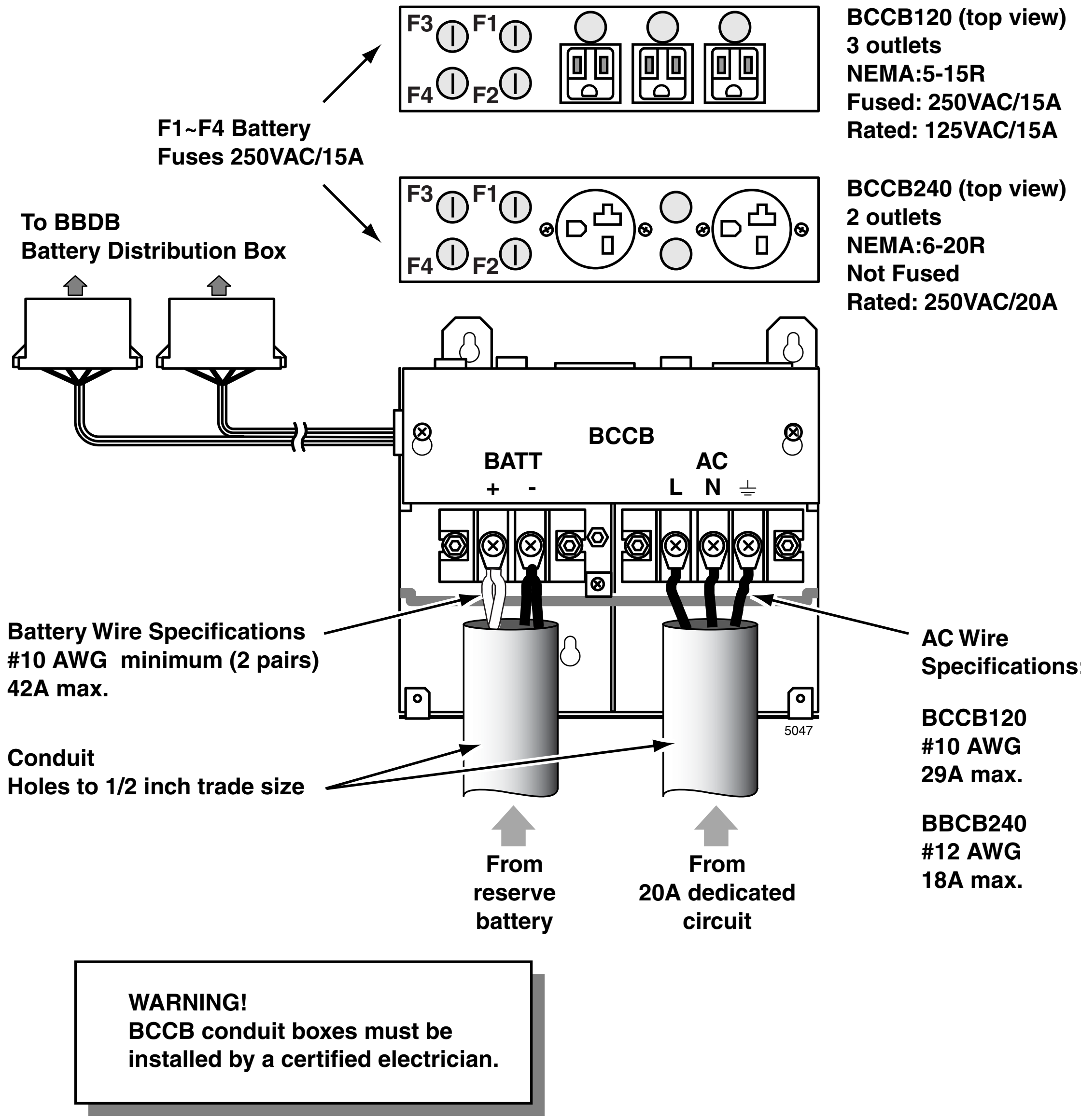


Figure 4-25 BCCB AC Power and Battery Connections

Notes

- When floor mounting the CTX670, the batteries must be installed by a licensed electrician per local electric code using conduit. (See Figure 4-25.)
- Batteries should be installed in a customer-supplied commercial battery box or enclosed rack.

Reserve Power/AC Wiring for Three or More Cabinets (Floor Mount)

Floor-mounted systems with three or more cabinets require a Conduit Connection Box (BCCB) to connect reserve power cabling and AC power cabling to the system. Only a qualified electrician can install cabling between the reserve power batteries and AC power cabling to the conduit connection box. All other steps required to install reserve power, including installation of the Battery Distribution Box (BBDB), can be accomplished by the normal system installer.

➤ **To connect reserve power to floor-mounted systems with three or more cabinets**

See Figures 4-12~4-17 and follow these steps:

1. Make sure that the Conduit Connection Box is installed on the bottom base cabinet (see Figure 4-24). The box can be installed by the regular system installer.
2. Have a licensed electrician install conduit and battery cabling to the Conduit Connection Box per local electrical codes. The remaining steps in this procedure can be performed by the regular system installer (see Figure 4-25).
3. Install the Battery Distribution Box on the second cabinet (the cabinet directly above the bottom cabinet), see Figure 4-24.
4. Plug the two Conduit Connection Box cables (coming from the left side of the BCCB box) into the Battery Distribution Box (BBDB).

Important! *The cabinets must be connected to the (live) AC power source, and the power supply On/Off switches set to On prior to the final step of connecting the reserve power batteries to the power supplies via the BATT +/- receptacle. If the batteries are connected after AC power is lost, reserve power will not function.*

5. Connect cables from the (BBDB) Battery Distribution Box to the BATT +/- receptacle of individual power supplies. BBTC2A-2M cables come with each BBDB distribution box (see Figure 4-12).
6. To test reserve power operation, turn off the system AC power circuit breaker with power supply On/Off switches in the On position. The system should continue to operate without interruption.

Note AC/DC wiring and conduit must be installed by a licensed electrician per local electrical code (conduit trade size is 1/2 inch).

See “Install Reserve Power” on page 4-29 for battery specifications and wiring guidelines.

Step 7: Install Processor and Universal PCBs

This section provides procedures for the installation of CTX670 processor (or common control) PCBs.

The CTX670 system Base and Expansion Cabinets are shipped empty. PCBs are not installed at the factory. Universal PCBs must be placed according to the configuration information obtained and developed in Chapter 1 – Configuration. PCB installation is in Chapter 6 – PCB Installation.

- Install PCBs only after installing the Base Cabinet and, if applicable, Expansion Cabinets per the Cabinet Installation section in this chapter.
- Be sure the power supply has been tested and the ground has been checked (see "Install Power Supply" on page 4-6.
- Install universal slot PCBs per the CTX670 configuration guidelines (see "Worksheet 6: Strata CTX670 Cabinet Slots" on page 2-37.
- Install the metal mesh shield, B50MT around the 25-pair cables connected to PCBs per Figure 4-10.

Important! *After all PCBs are installed, be sure to slide the locking bar into the lock position to ensure that the PCBs remain in place (see Figure 4-3 on page 4-9).*

PCB Installation Considerations

The Base Cabinet has ten slots. The first two slots, labeled "B101" and "B102" are reserved for the common control unit and future feature upgrades. The next eight slots (labeled "S101" ~"S108") are universal and capable of hosting any of the station, line, and option interface PCBs compatible with the CTX670 systems.

The Expansion Cabinets have ten universal slots, labeled "S_01," "S_02," etc., where the blank space of the label represents the number of the Expansion Cabinet. Like the universal slots in the Base Cabinet, these universal slots are capable of hosting any of the station, line, and option interface PCBs.

Cabinets are numbered from 1 to 7. The Base Cabinet is numbered 1; the first Expansion Cabinet, number 2; the second Expansion Cabinet, number 3, etc. See the CTX670 Configuration and PCB Installation section for details.

PCB Option Considerations

CTX670 PCBs can be configured for a variety of hardware and software options. Hardware options are defined as either internal (generally related to optional PCB subassemblies) or external (related to connection of peripheral equipment such as background music, voice mail, etc.).

Hardware Options

Some PCBs must be configured for hardware options prior to installation of the PCB in the cabinet. Configuration instructions for internal hardware options are provided in the individual PCB installation procedures in this chapter and in Chapter 6 – PCB Installation. Configuration instructions for external hardware options are provided in Chapter 12 – Peripheral Installation.

Software Options

PCBs are configured for software options through programming, following the installation instructions of the PCBs. A programming overview for each PCB is provided in the individual

PCB installation procedures in this chapter. Refer to the *Strata CTX Programming Manual* for detailed programming instructions.

BCTU1A/BEXU1A Installation

This section explains how to install the new BCTU/BEXU processor PCBs into Strata CTX670 telephone systems. The BCTU/BEXU processor PCBs require Strata CTX Release 2.1, or higher, software and CTX WinAdmin Release 2.1, or higher, software.

The BCTU can be installed without the BEXU for a maximum capacity of 192 ports. It supports the Base and one Expansion cabinet. The BCTU by itself supports all the features and capacities equal to the BECU/BBCU without the BEXS and BBMS expansion PCBs.

If the BEXU is installed with the BCTU, 672 ports are available, along with all the features and capacities equal to the BECU/BBCU with BEXS and BBMS expansion PCBs.

The BCTU or BEXU do not have a built-in modem. The AMDS must be installed on the BCTU if remote administration is required over telephone lines.

CAUTION!

- **Do not remove the plastic insulation shield from the back of the BEXU PCB. If the shield comes off, do not allow the back of the PCB to contact metal.**
- **The BCTU and BEXU PCBs are shipped from the factory with the battery jumper in the "Off" position. Ensure it is moved to the "On" position before installing the processor to protect customer configuration information stored in the processor RAM. The battery will protect RAM for approximately six years. Otherwise, to conserve the lithium battery, move the jumper to the "Off" position.**
- **When packaging the BCTU and BEXU PCBs, use only a nonconducting material enclosure, such as plain cardboard. Conductive material can cause the internal battery to discharge and erase memory in the BCTU and BEXU PCBs.**
- **Make sure that the power supply is Off when installing the BCTU and BECU PCB or damage to the board could result.**
- **When removing the BCTU1A and BEXU1A, first detach the cable connecting the BCTU and BEXU1A.**

---

1. On the BCTU PCB (see Figure 4-26), set the battery jumper, "BATT" to the "On" position. Although you can fit the jumper plug in a horizontal position, this would be incorrect. Be sure to place the "BATT" jumper in the correct vertical and upright position (see Figure 4-27.)

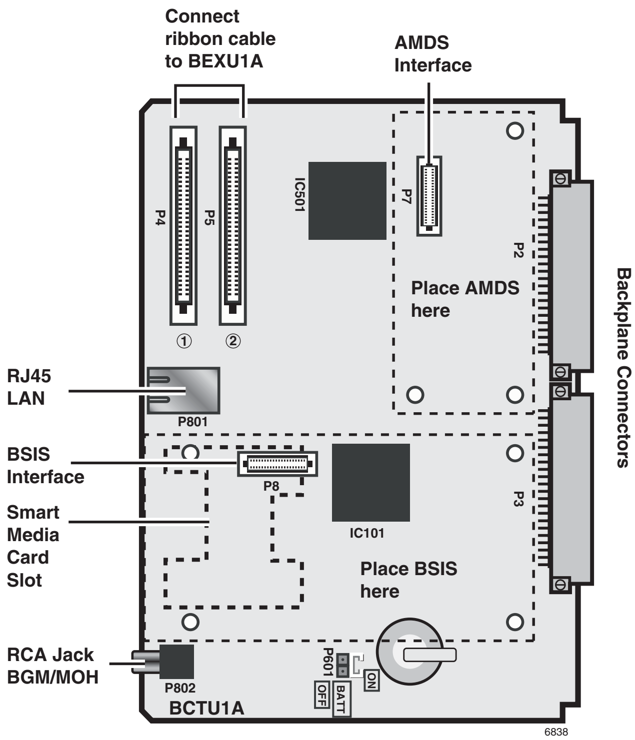


Figure 4-26 BCTU1A Base Processor

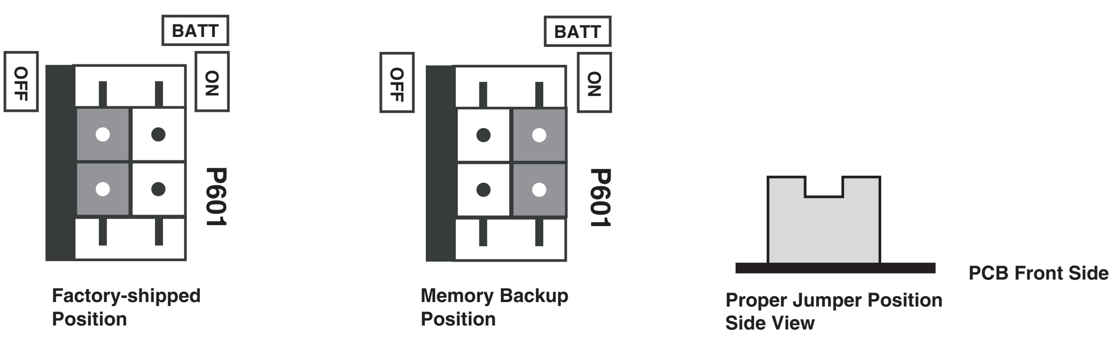


Figure 4-27 Correct Battery Jumper Position

2. Install the AMDS on the BCTU if remote maintenance is required.
3. Install the BSIS on the BCTU if SMDR or SMDI is required.
4. Install the BCTU Base Unit processor in slot B102 (see Figure 4-28). Ensure the component side of the BCTU PCB is facing right when installing it in the Base Cabinet.
5. If you are installing more than one Expansion Unit, install the BEXU processor in slot B101 (see Figure 4-29).
6. Connect the two supplied ribbon cables from the BCTU to the BEXU by placing the ribbon connectors over the appropriate connector on the PCB (see Figure 4-30). Each ribbon connector has two locking tabs (top and bottom) that must be pressed down to lock the connector to the PCB.
7. Insert the SmartMedia card (gold contacts face right, notched corner faces forward and down) into the slot on the BCTU.

CAUTION!

- **Heed any handling instructions in the SmartMedia Card User's Manual.**
- **Avoid bending or subjecting the card to impact.**
- **When the card is not in used, store it in its sleeve.**
- **Avoid touching the connectors and protect the card from dirt, dust and liquids.**
- **Toshiba recommends backing up important data stored on the card.**

---

8. Proceed with the system startup procedure in the *Strata CTX Programming Manual.*

Notes

Unlike the BBCU/BECU, the following are controlled by software programming for the BCTU/ BEXU:

- MOH/BGM source volume adjustments
- Mu/A Law selection

Unlike the BBCU/BECU, the internal modem is optional with the BCTU/BEXU processor. AMDS interface (optional) plugs onto the BCTU card. See Table 4-9.

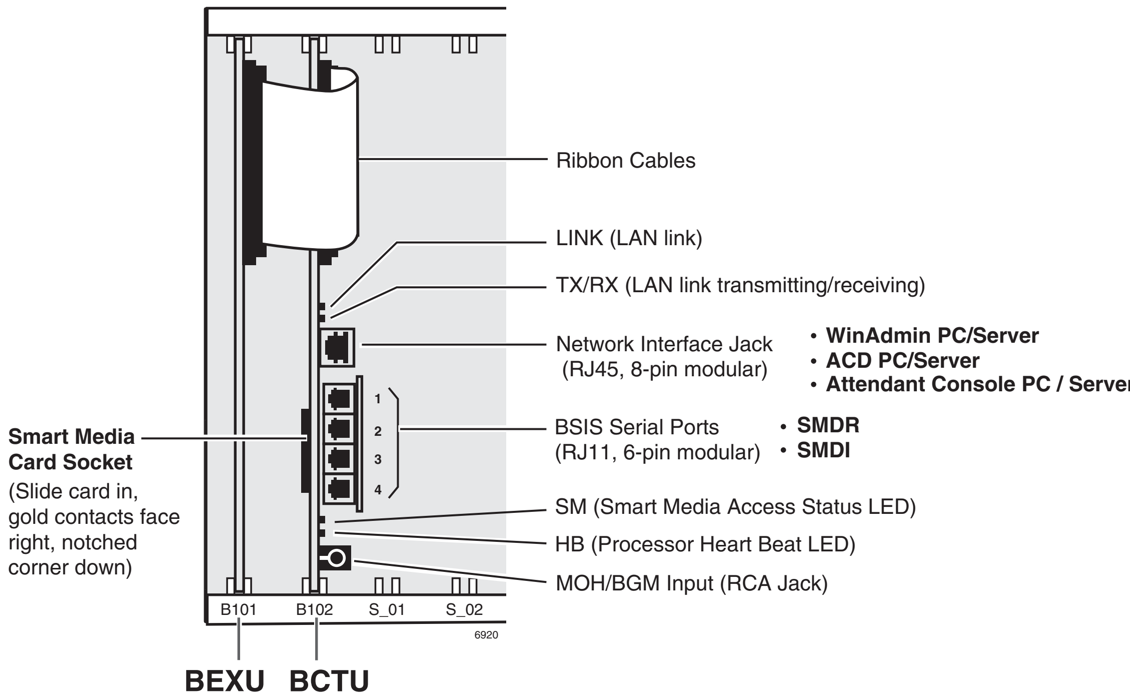


Figure 4-28 BCTU/BEXU Processor PCB Connectors

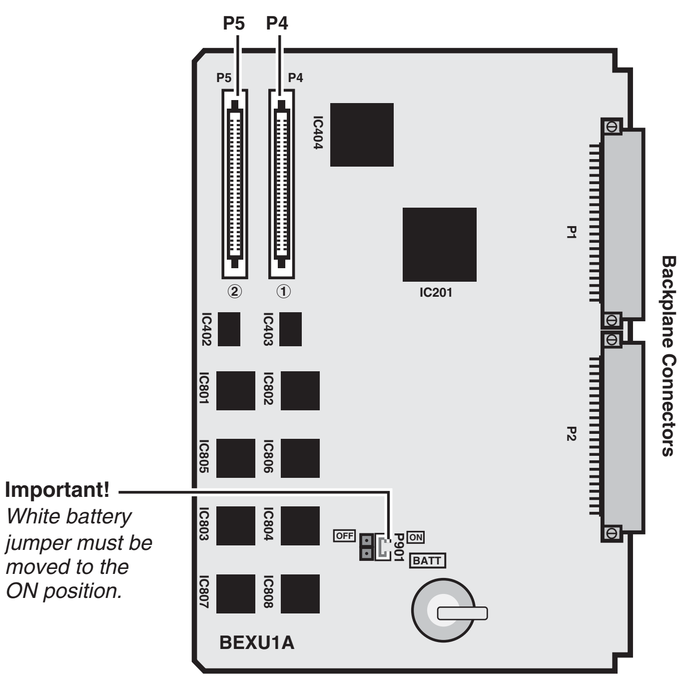


Figure 4-29 BEXU1A Expansion Unit Processor

The following tables provide details about the connectors and indicators on the BCTU1A and BEXU1A PCBs.

Table 4-9 BCTU Controls, Indicators, and Interface Connectors

Control/Indicator/Connector	Type of Component	Description
P801	RJ45 LAN	Network interface port
P501	SmartMedia house	SmartMedia Interface
P802	RCA Jack	BGM/MOH interface
P2, P3	44-pin connectors	Processor backplane
P601 BATT	Jumper Plug	Must always be in the ON position to maintain customer data.
LINK, TX, RX	LED	LAN link transmission and receive indicator
SM	LED	SmartMedia access indicator
HB	LED	Processor operation indication
P7	60-pin connector	AMDS interface (optional)
P8	60-pin connector	BSIS interface (optional)
Connector P5	Connector and ribbon cable	Ribbon cable connector to P4 (1) on the BEXU.
Connector P4	Connector and ribbon cable	Ribbon cable connector to P5 (2) on the BEXU.

Table 4-10 BEXU Controls, Indicators, and Interface Connectors

Control/Indicator/Connector	Type of Component	Description
P901 BATT	Jumper plug	Must *always* be in the ON position to maintain customer data.
P4, P5	Connector and ribbon cable	Ribbon cable connector to BCTU1A.

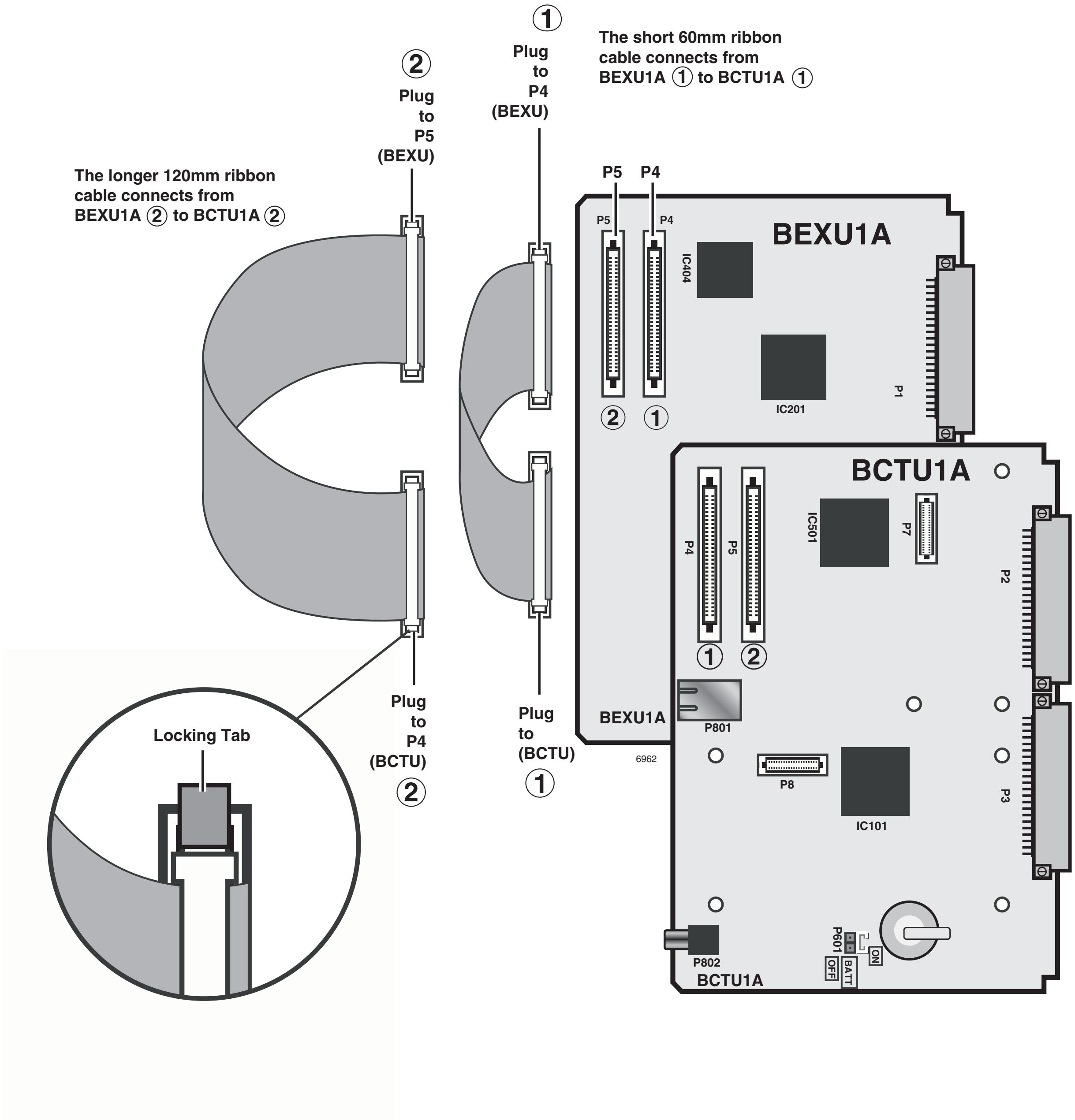


Figure 4-30 Detailed Ribbon Cable Connection for BEXU1A and BCTU1A

BECU/BBCU Installation

CAUTION!

- **Do not remove the plastic insulation shield from the back of the BBCU PCB. If the shield comes off, do not allow the back of the PCB to contact metal.**
- **The BBCU PCBs are shipped from the factory with the battery jumper in the "Off" position. Ensure it is moved to the "On" position before installing the BBCU to protect customer configuration information stored in the BBCU RAM.**
- **When transporting the BBCU PCB, keep the battery jumper in the "On" position in order to save the configuration data stored in BBCU RAM. (The battery will protect RAM for approximately six years.) Otherwise, to conserve the lithium battery, move the jumper to the "Off" position.**
- **When packaging the BECU and BBCU PCBs, use only a nonconducting material enclosure, such as plain cardboard. Conductive material can cause the internal battery to discharge and erase memory in the BECU and BBCU PCBs.**

---

1. Set the battery jumper, "BATT," on the BBCU PCB to the "On" position.
2. On the BBCU, make sure the Mu/A jumper plug is set to the Mu position (U.S. and Canada).
3. Before you install the BBMS, make sure the "ATTACHED BBMS" jumper is set to "NO."
4. After installing the BBMS, change the "ATTACHED BBMS" jumper to "YES."
5. If you are installing the Basic system, skip to Step 6. If you are installing the Expanded system, install the BBMS and BEXS onto the BBCU and BECU respectively.
6. Install the BBMS onto the BBCU (see Figures 4-31 and 4-32). Install the BEXS onto the BECU (see Figures 4-33 and 4-35).
7. If serial ports are required, install the BSIS onto the BECU (see Figures 4-34 and 4-35).
8. Make sure that the power supply is Off when installing the BBCU and BECU PCB or damage to the board could result.
9. Install the BECU in slot B101 and the BBCU in slot B102, then connect the two BECU ribbon cables to the BBCU, as shown in Figure 4-36.
10. Proceed with system startup procedure in the *Strata CTX Programming Manual.*

➤ **To adjust the CTX670 MOH/BGM source**

➤ Adjust the VR1 potentiometer to the desired volume level while listening to MOH or BGM (see Chapter 12 – Peripheral Installation).

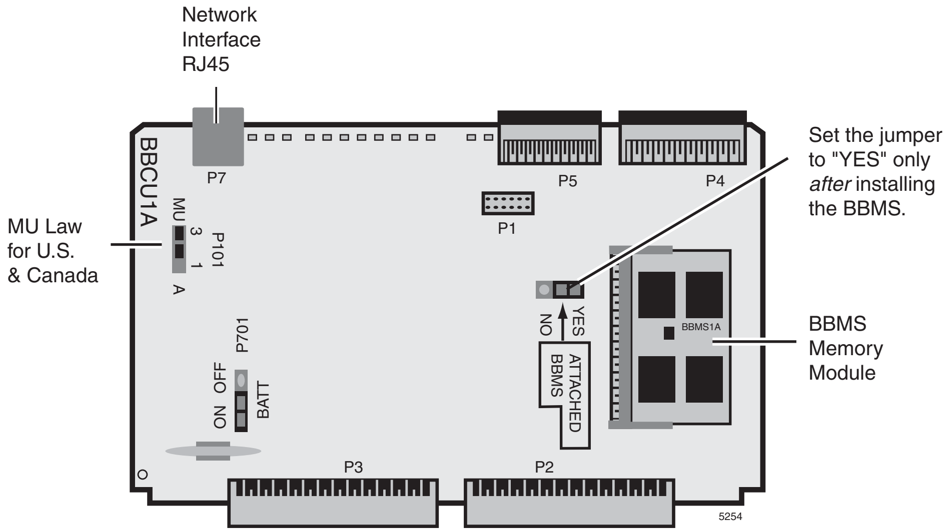
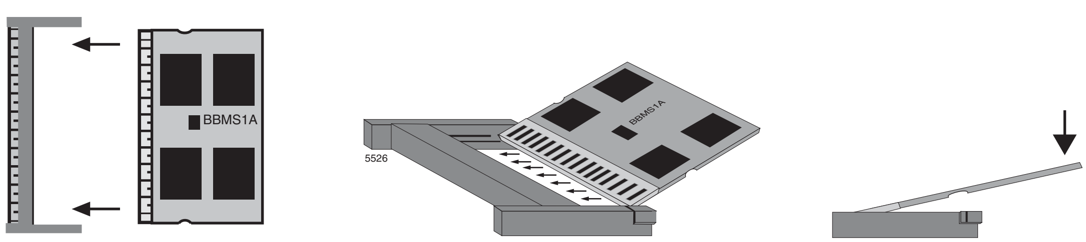


Figure 4-31 BBCU Processor PCB

CAUTION! Be careful installing the BBMS (Figure 4-32). It is fragile.



1. Hold the BBMS top-side up. The top side has five chips and “BBMS1A.”
2. Slide the BBMS into the socket.
3. Push down on the outer edge of the BBMS. It should “snap” down.

Figure 4-32 Installing the BBMS Backup Memory Module on the BBCU

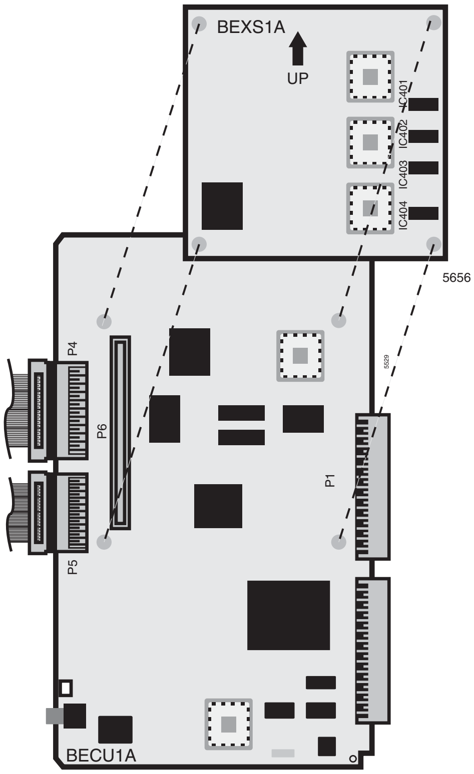


Figure 4-33 Installing BEXS onto BECU

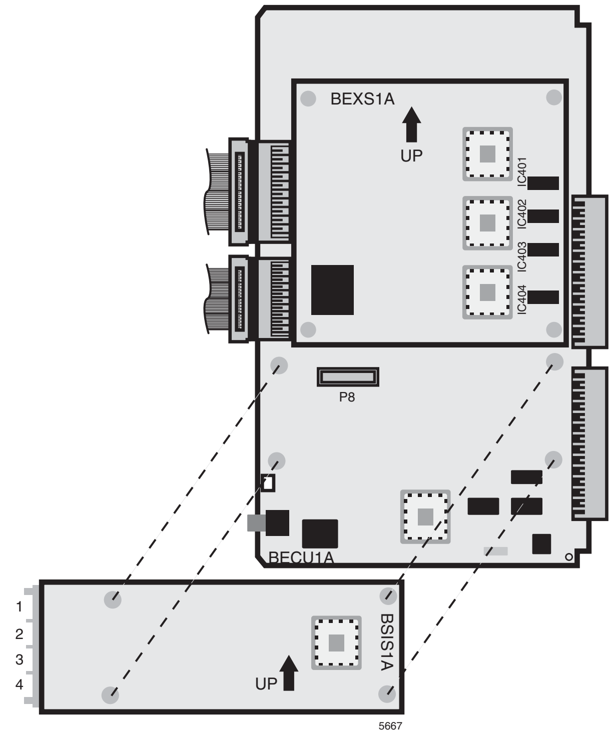


Figure 4-34 Installing BSIS onto BECU

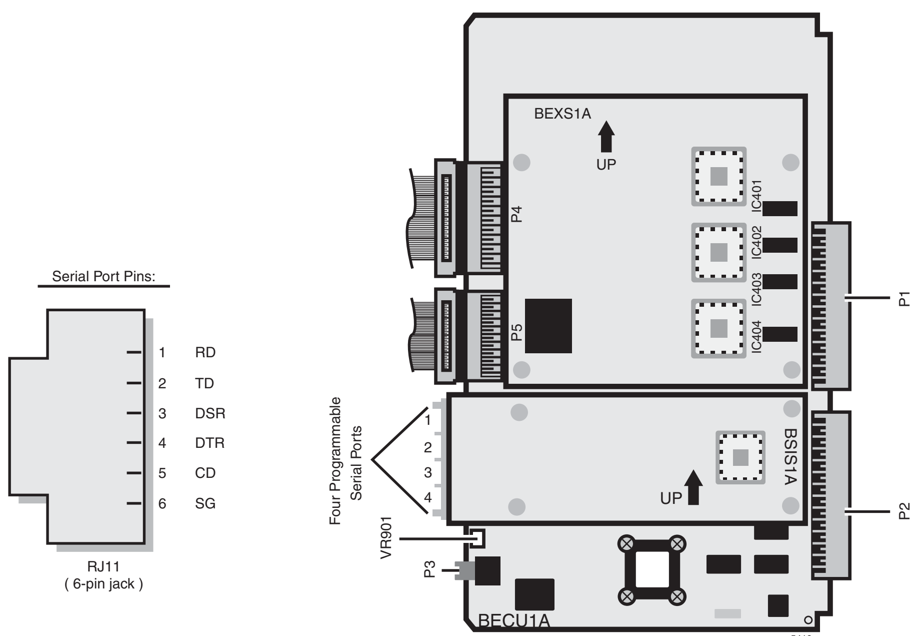


Figure 4-35 BECU with BEXS and BSIS

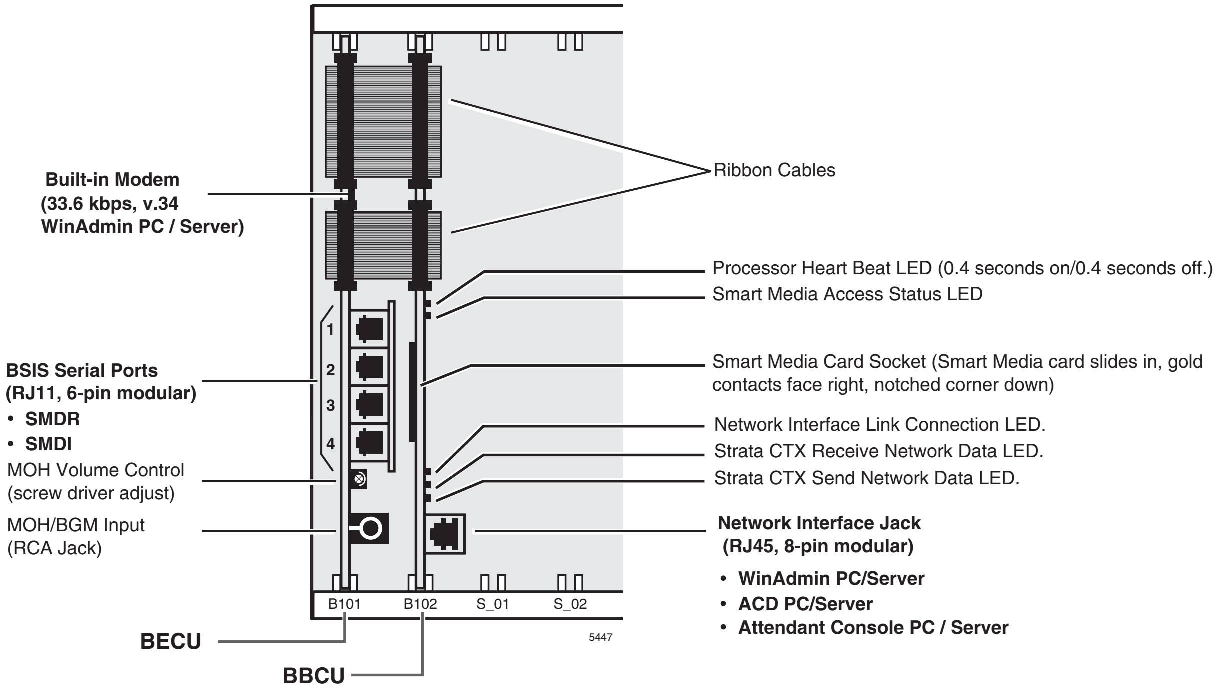


Figure 4-36 BBCU/BECU Processor PCB Connectors

11. Insert the BECU into the "B101" slot in the Base Cabinet (see Figure 4-36). Ensure the component side of the BBCU PCB is facing right when installing it in the Base Cabinet.
12. Insert the BBCU into slot B102.
13. Connect the supplied ribbon cables between BECU and BBCU.
14. Insert the SmartMedia card (gold contacts face right, notched corner faces forward and down) into the slot on the BBCU Figure 4-36 and 4-37.

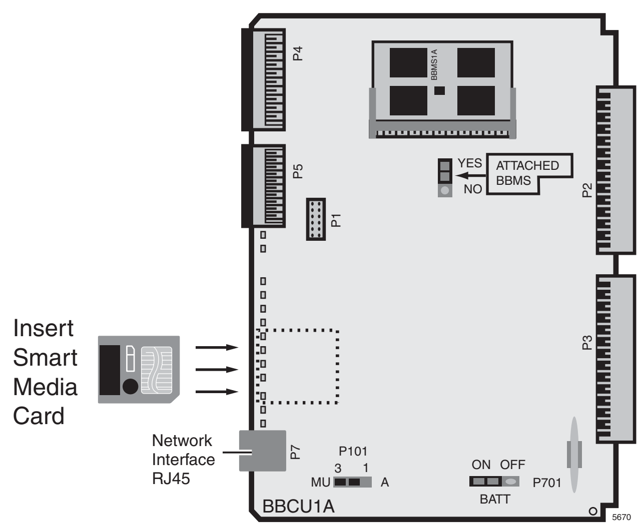


Figure 4-37 SmartMedia Card Installation

CAUTION! **Heed any warnings or handling instructions in the SmartMedia Card User's Manual.**
Avoid bending or subjecting the card to impact.
When the card is not in used, store it in its sleeve.
Avoid touching the connectors and protect the card from dirt, dust and liquids.
Toshiba recommends backing up important data stored on the card.

Table 4-11 BECU Controls, Indicators, and Interface Connectors

Control/Indicator/ Connector	Type of Component	Description
VR901	Trim potentiometer	Adjusts volume for MOH/BGM sources.
P3	RCA jack	BGM/MOH interface
Connector P5	Connector and ribbon cable	Ribbon cable connector to BBCU.
Connector P4	Connector and ribbon cable	Ribbon cable connector to BBCU.
BSIS	Four ports of I/O RS-232	(Optional unit) Adds up to four serial ports.
BEXS	Time switch	(Optional unit) Required for Expanded system, along with the BMMS.

Table 4-12 BBCU Controls, Indicators, and Interface Connectors

Control/Indicator/Connector	Type of Component	Description
BATT	Jumper plug	Must *always* be in the On position to retain processor RAM data. The Strata CTX will not operate properly if the jumper is in the Off position or if it is not installed.
P7	RJ45	Network interface port.
BBMS Module	Subassembly module	Memory module. (Optional unit) Required for Expanded system, along with the BEXS.
ATTACHED BBMS (Yes/No)	Jumper	Jumper setting must always be set to “Yes,” regardless of whether the BBMS is installed or not.
P4	Connector and ribbon cable	Ribbon cable connector to BECU.
P5	Connector and ribbon cable	Ribbon cable connector to BECU.
P10 Mu /A Law	Jumper plug	Jumper setting must be set to “Mu” law for Canada and the U.S. For more information on Mu law/A law settings, see “Country Settings On/Off” on page 11-20.
	SmartMedia Card socket	Holds SmartMedia Card which is used to Backup/Restore Customer Data, Upgrade Operating System, Log and Trace Maintenance information.

Remote Expansion Cabinet Unit

The RRCU1A PCB enables a CTX670 Expansion Cabinet to be located up to three kilometers from its Base Cabinet. One RRCU1A connects to up to two ribbon-type Data Cables and applies the inter-cabinet signal to a fiber-optic pair. One fiber pair can support one or two expansion cabinets in one remote location using one RRCU1A in the Base Cabinet and another in the Remote Expansion Cabinet.

A CTX670 Base Cabinet will support up to six RRCU1A PCBs. A CTX670 will support up to six Remote Expansion Cabinets.

An inter-cabinet Data Cable in the Base Cabinet is attached to an RRCU1A which converts the signal and uses an LED source to apply the signal to 500 MHz/km multi-mode fiber. Another RRCU1A in the Remote Expansion Cabinet receives the LED signal, converts it back to its original form and applies it to a ribbon Data Cable connected to the Remote Expansion Cabinet. See Figure 4-38.

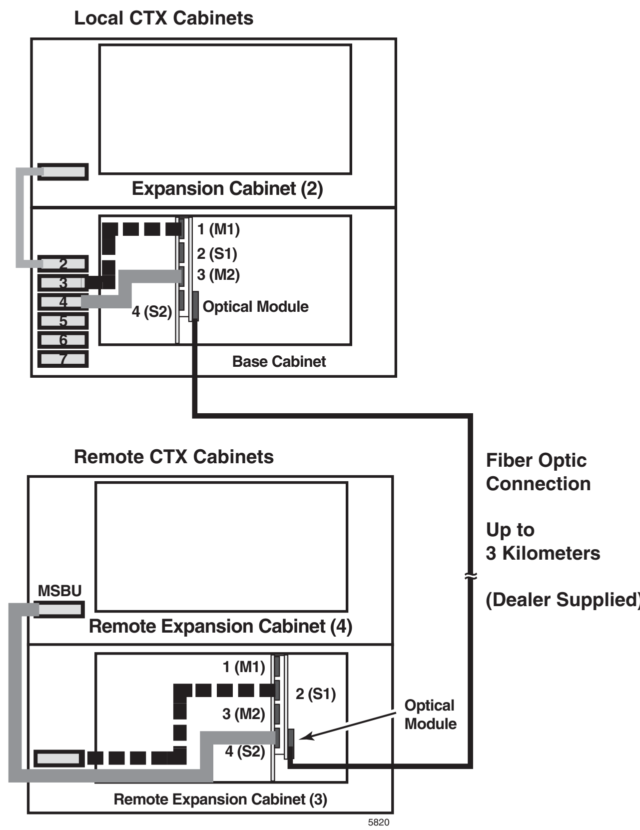


Figure 4-38 Remote Expansion Cabinet Connection

This is a hardware solution and has no effect on software or administration. Remote cabinets support all line and trunk interfaces.

Important! *Network clock signals can only be derived from digital trunk PCBs, such as the RDTU and RPTU, that are installed in the Base Cabinet (Master) location. Do not install these digital trunk cards into the Remote Cabinets.*

RRCU1A cards are used at both the Base (Master) and Remote (Slave) Cabinet locations. The card set consists of an RRCU1A PCB and its ROMS1A daughter board. The RRCU1A connects to the inter-cabinet Data Cables, holds the Remote/Slave option jumpers, and has an RS-232C port for monitoring the fiber connection. (See Figure 4-41.)

The ROMS1A daughter board holds an SC-type fiber connector, a connector for control of two 8-circuit DPFT units, and status LEDs.

Remote Cabinet Installation Instructions

All instructions apply to both the Base Cabinet and the Remote Expansion Cabinet except where specifically noted.

1. Install cabinets according to the instructions given at the beginning of this chapter. Pay particular attention to wiring and grounding instructions given for Remote Expansion Cabinets.
2. If installing a standalone Remote Expansion Cabinet, or the first in a stack, set the "BASE/ EXP" switch to "BASE" in accordance with Figure 4-3.
3. Cabinets in which RRCU cards are installed must be modified to protect the routing of the cables through the cabinet.
   - Attach the plastic guide to the bracket provided with the RRCU1A card. See Figure 4-40.
   - Attach the bracket to the inner wall of the cabinet.
4. Install the RRCU Card
   - Select correct jumper options (see Figure 4-41). On the Master side, both option plugs connect the center pin to the upper pin (M1, M2). On the Slave side, both option plugs connect the center pin to the lower pin (S1, S2).
   - Remove the protective rubber cap from the fiber connector on the ROMS1A daughter board. See Figure 4-42.
5. Install a BCTC1A top cover on the topmost cabinet (see Figure 4-39).

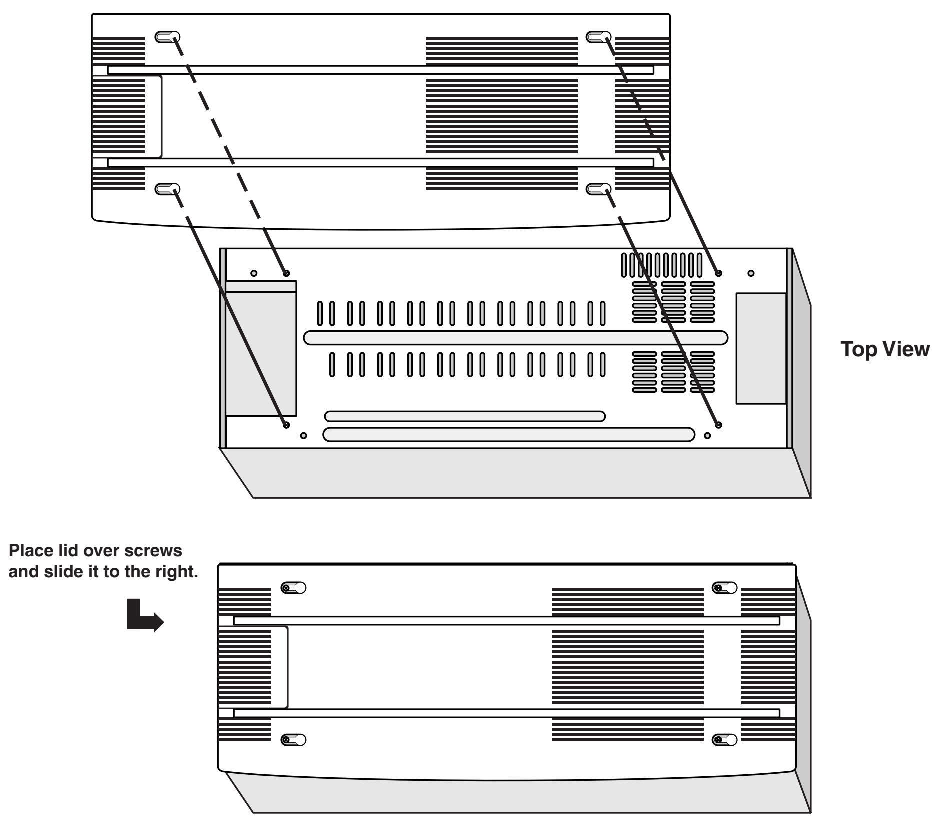


Figure 4-39 Remove/Replace Remote Cabinet Cover

Important! *When installing the RRCU, be sure to put the card in the slot before attaching the data cables. Detach the data cable before removing an RRCU1A. Failure to do so may cause interference with other data highways.*

6. Insert the cards
   - On the Master side, the RRCU card may be installed in Slots 1~8.
   - On the Slave side, the RRCU card may be installed in Slots 1~10.
   - The RRCU1A is a non-timeslot card and can be installed in slots normally left vacant adjacent to digital trunk cards.
7. Connect the data cables
   - At the Base Cabinet, attach an BDCL1A data cable from the data cable connector at the left of the cabinet to Connector M1 or M2 on the RRCU card. (Cables are provided according to the connectors on the RRCU card to which they are attached, see Table 4-13.)
   - The cabinet connected to M1 in the base emerges on connector S1 of the RRCU1A at the Remote Expansion Cabinet.
   - The cabinet connected to connector M2 of the RRCU in the base emerges on connector S2 of the RRCU1A at the Remote Expansion Cabinet. See Figure 4-41.
     - Route the cable through the cabinet according to Figure 4-40.
     - Coil the excess and attach it to the grommet on the cabinet wall with a tie wrap. Be careful not to bind the cable tightly.
     - Close the data cable doors.

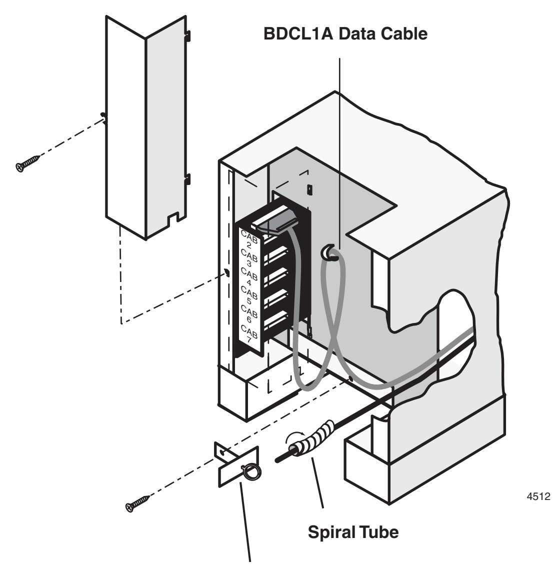


Figure 4-40 Insert Optical Fiber Through

Table 4-13 Remote Cabinet Data Cables and Connectors

Data Cables	RRCU Connectors			
	M1	S1	M2	S2
BDCL1A-MS1	X	X		
BDCL1A-M2			X	
BDCL1A-S2				X

X = applies to connector

8. Connect the fiber optic cables
   - Pass the fiber optic cable through the protective tube.
   - Route the tube through the clamp attached to the inner cabinet wall and secure the clamp
   - Attach fiber to the SC connectors on the ROMS1A daughterboard.
   - The TX side of the Master connects to the RX side of the slave.
   - The RX side of the Master connects to the TX side of the slave.
   - TAIS recommends that the cables be marked within the cabinet for ease of maintenance.
   - Observe the minimum bend radius of 30mm.
9. Restore power.

The RRCU PCB and its controls and connectors are shown in Figure 4-41 and Table 4-14.

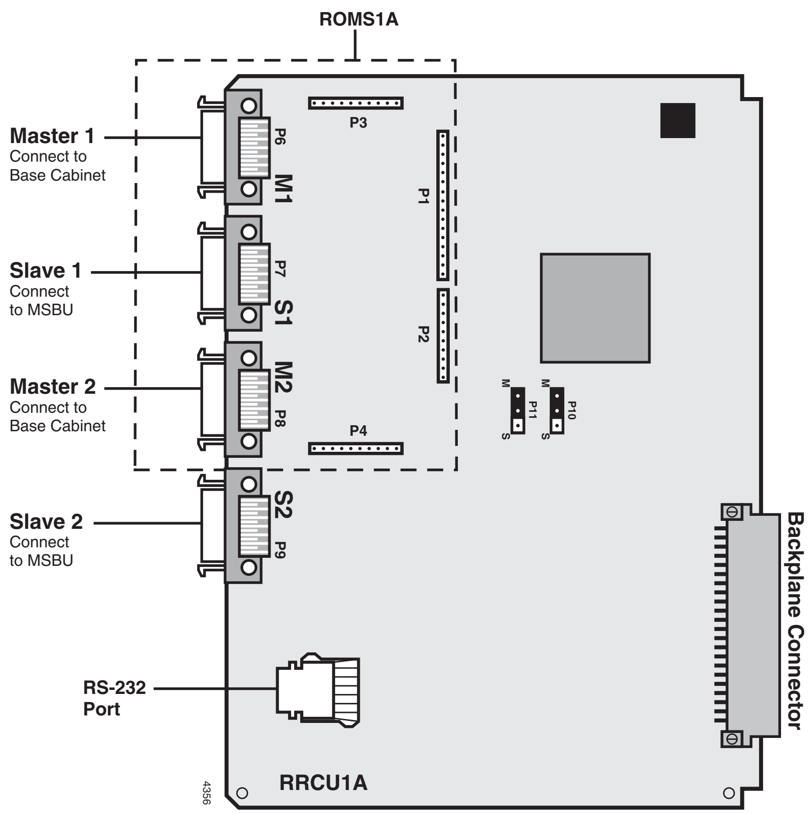
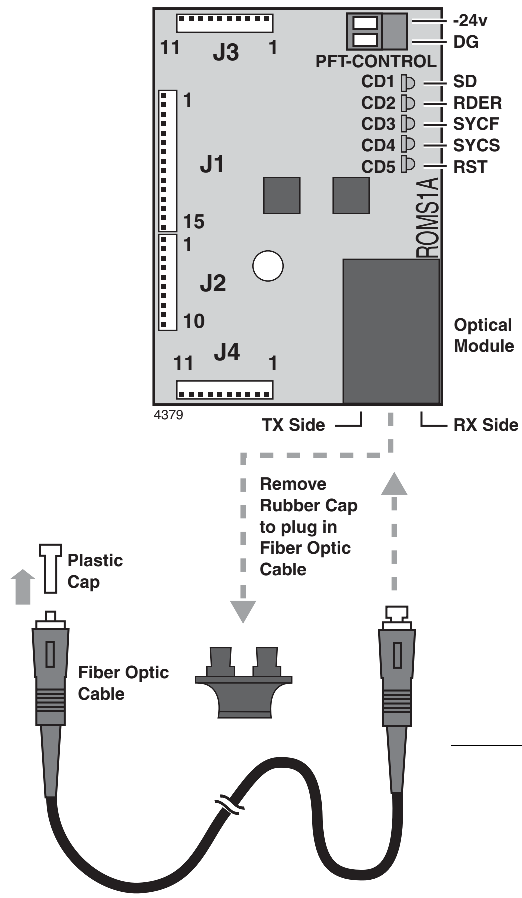


Figure 4-41 Remote Expansion Cabinet Printed Circuit Board (RRCU1A)

Table 4-14 RRCU Controls

Control/Indicator/Connector	Type of Component	Description
Jumper Plug P10	3-terminal Jumper Plug	Master Mode (M connections)
Jumper Plug P10		Slave Mode (S connections)

The ROMS subassembly and fiber optic cable connectors is shown in Figure 4-42. Table 4-15 lists the fiber optic cable specifications.



CAUTION! **Inserting the fiber connector at an angle or too forcefully can cause**

Figure 4-42 ROMS1A Subassembly

Table 4-15 Fiber Optic Specification

Item	Specification
Transmission Speed	155.52 Mbps
Optical Source	LED, 1300 nm
Fiber Type	Multi-mode, Graded Index Fiber (GIF)
Core Diameter	62.5 micrometers
Cladding Diameter	125 micrometers
Connector Type	SC (2-pin transmit and receive)
Maximum Fiber Length	3 km (500~1000 MHz/km fiber) 2 km (200~400 MHz/km fiber)
Optical Budget (Loss)	9 dB (one way)
Minimum Bend Radius	30 mm
Round Trip Delay Time	30 micro seconds.
Transmit Power	>= -23.5 dBm
Receiver Sensitivity	<= -30 dBm

The fiber connection must conform to both the Optical Budget and Fiber Length specifications. It is possible to have a fiber connection longer than 3 km with less than 9 dB of loss; however, the CTX670 Remote Expansion Cabinet is sensitive to signal delay and cannot be guaranteed to operate at distances greater than 3 km.

Status Indicators

The RRCU1A card set provides two status indicators: a set of LEDs on the ROMS1A card and an RS232C Monitor Port on the RRCU1A. Status indications are provided according to Tables 4-16 and 4-17. Binary Code Output is generated upon change of a reported condition.

Table 4-16 RS-232C Binary Code Output

BIT	Label	Function	Normal Condition
D0	SD	1: Optical signal not detected 0: Optical signal detected	0
D1	RDER	1: Code rule violation detected in received data 0: Code rule violation not detected in received data	0
D2	SYCF	1: Frame synchronization of received data not established 0: Frame synchronization of received data established	0
D3	SYCS	1: System synchronization between cabinets not established 0: System synchronization between cabinets established	0
D4	RST	1: Reset signal from CTU detected 0: Reset signal from CTU not detected	0
D5		Not Used	0
D6		Not Used	1
D7		Not Used	0

Table 4-17 LED Status Indications

LED	Function	Normal Condition
PWR	Blinking: Power is supplied Off: Power is not supplied	Blinking
SD	On: Optical signal not detected Off: Optical signal detected	Off
RDER	On: Code rule violation detected in received data Off: Code rule violation not detected in received data	Off
SYCF	On: Frame synchronization of received data not established Off: Frame synchronization of received data established	Off
SYCS	On: System synchronization between cabinets not established Off: System synchronization between cabinets established	Off
RST	On: Reset signal from CTU detected Off: Reset signal from CTU not detected	Off

Monitor Port Communication Parameters

Data rate:	9600 bps
Data word bits:	8
Parity:	None
Stop bits:	1

Monitor Port Pin Assignments

The monitor port pin connection and pin assignments are shown in Figure 4-43.

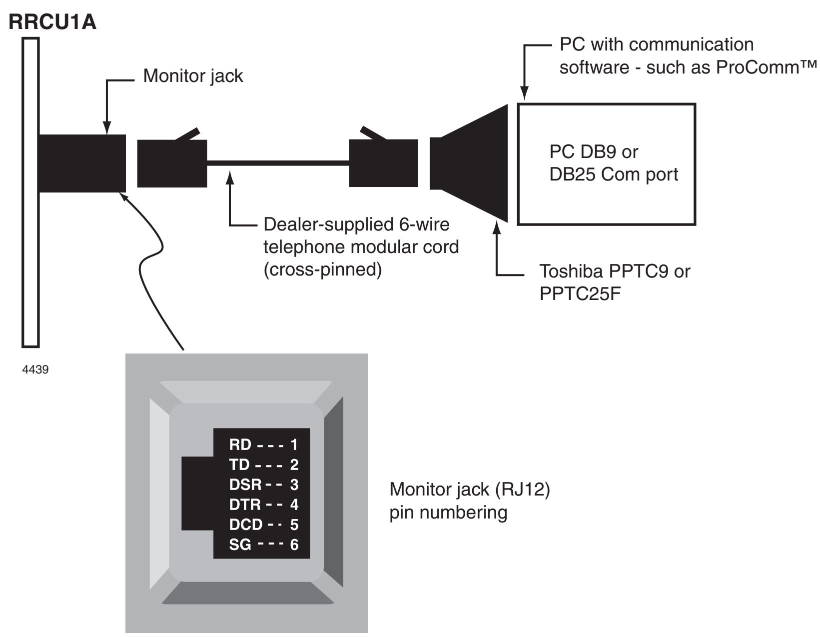


Figure 4-43 RRCU1A Monitor Jack

Rack Mount Cabinets 5

The Strata CTX Rack Mount Cabinets consist of a base cabinet (CRSUB672A) and expansion cabinets (CRSUE672A). The cabinets are made of plated sheet metal, dark gray in color.

CAUTION! **Toshiba does not support mixing floor/wall-mountable cabinets with Rack Mount cabinets in a system installation (local or remote). Mixing cabinets in an installation causes EMC, EMI, RFI and improper grounding problems. However, you do not have to match the remote cabinets to the local cabinets. For example, the local cabinets can be floor/wall-mountable while the remote ones are rack mount or vice versa.**

The 19 inch-wide rack must be supplied by the dealer.

Basic Specifications

Dimensions of Base Cabinet	Height: 10.5 inches (267mm) Width: 1.58 feet (483mm—with bracket) Depth: 1.17 feet (358mm)		
Weight of Base Cabinet	22.04 lbs. (10 kg)		
Power Supply Unit (PSU)	BRPSU672A (initially built in)		
19" Rack Installation Dimension	IEC297-1 (EIA RS 310-D) 465.1mm (front face screw pitch – width)		
Installation	Cannot be floor or wall mounted.		
Optional Equipment	Power Strip Box[1]	BRPSB120A	Option
		BRPSB240A	Option
		RPSB2A	Not applicable
		BPSB240A	Not applicable
	Reserve Power Battery Distribution Box[2]	BBDB1A	Option
	From PSU to Battery Cable	PBTC1A-3M	Option
	From BBDB to Battery Cable	BBTC1A-2.0M	Option
	AC240V Power Supply Cord	BACL240A	Option
	Conduit Connection Box[3] (No UL requirement.)	BCCB120A	Not applicable
		BCCB240A	Not applicable

1. Power Strip Boxes for traditional cabinets cannot be used for rack mount cabinets.
2. Reserve batteries are connected using the same battery distribution box and battery cables as the CTX670 floor/wall-mountable cabinets.
3. Traditional cabinet floor mount conduit connection boxes cannot be used for rack mount cabinets.

Inspection

When the system is received, examine all packages carefully and note any visible damage. If any damage is found, do not open the packages. Contact the delivery carrier immediately and make the proper claims.

After unpacking (and before installing), check the system against the packing list and inspect all equipment for damage. If equipment is missing or damaged, contact your supplier immediately.

Be sure to retain original packaging materials for re-use when storing or transporting system hardware.

Site Requirements

Space

- Do not install other devices between cabinets.
- No gap should exist between the cabinets. This provides EMC by connecting 2 screws between cabinets.
- The 3.28 ft. (1m) of space is necessary for the front and back of the rack to make installation and repair easy. Installation and wiring are done from the front and rear of the cabinets.
- A space measuring 1.75 inches (44.5mm) must always be left above the top of the rack mounted cabinet for the purpose of ventilation. It is also necessary to have a space between the top/bottom cabinet and any other device (shown below).

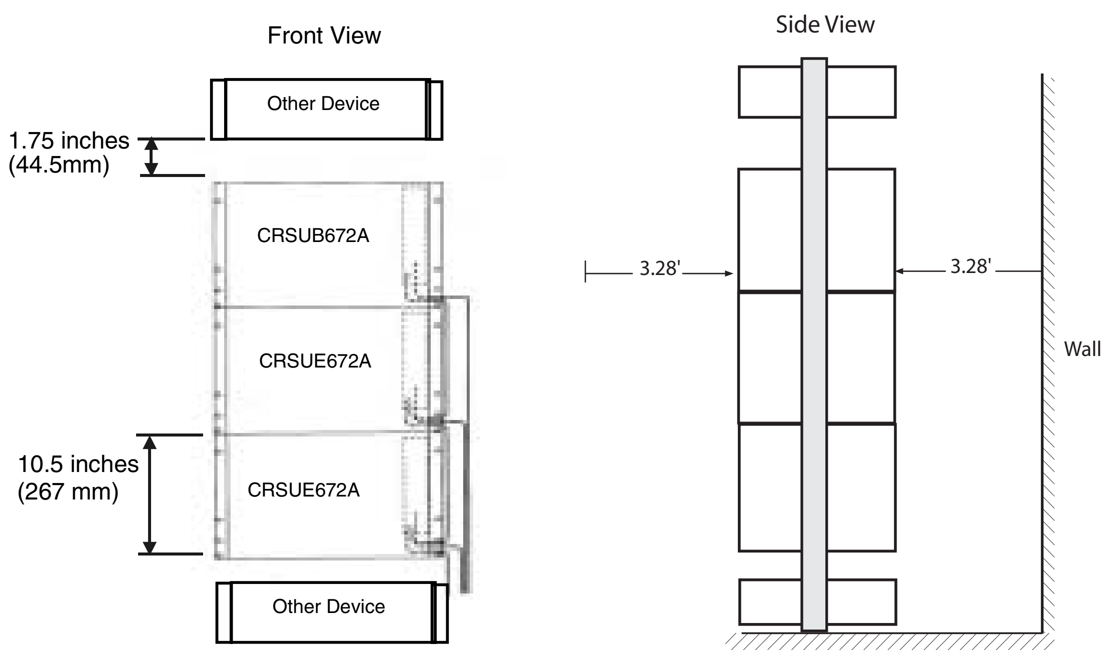


Figure 5-1 Required Space

Ventilation

- 50% or more of the front and back of the cabinet must be left open for ventilation.
- Cabinet rack must always be left open for ventilation.

Input Power

The Rack Mount Cabinets require an input power source of 115±10VAC or 208±20VAC or 240±20VAC, 50/60 Hz, single phase, for up to five cabinets; 208VAC or 240VAC is required for six or seven cabinets. The system requires one or two AC outlets that must be dedicated to system use, fused, and grounded.

CAUTION! **To avoid accidental power turn-off, do not use an On/Off wall switch for AC circuits dedicated for the use of the Rack Mount Cabinets.**

A reserve power source (two or four customer-supplied 12VDC batteries) can be connected to serve as a backup in case of power failure.

Environmental Conditions

CAUTION! **Equipment is for use in a Restricted Access Location.**

- Operating Temperature: 0~104 degree Fahrenheit (0~40 degree Centigrade)
- Operating Humidity: 20~80% relative humidity without condensation

Location

When selecting a location for the cabinets, the location *must be:*

- Dry and clean
- Well-ventilated
- Well-illuminated
- Easily accessible

The location *must not be*:

- Subject to extreme heat or cold
- Subject to corrosive fumes, dust, or other airborne contaminants
- Subject to excessive vibration
- Next to television, radio, office automation, or high frequency equipment

Power Considerations

Each Rack Mount Base and Expansion Cabinet houses a power supply that furnishes power to all of the stations and some of the peripherals that interface with the cabinet (see Table 2-60, "Strata CTX670 Electrical Characteristics" on page 2-47).

Reserve Power

Two or four customer-supplied 12VDC reserve batteries can be connected to the system to maintain normal operation during a power failure (see Table 2-63 on page 2-49 and Table 2-60 on page 2-47). The batteries are kept in a highly-charged state by the standard power supply and must be connected when the system is operating normally. Fully charged batteries must be connected when normal AC power is available, batteries cannot be connected after/during an actual power failure.

Underwriters' Laboratory (UL) and local electrical codes require certain standards for connecting commercial AC and reserve power to the rack mount system. Table 5-3 describes which assemblies may be required to meet UL and local electrical code standards. See "(Optional) Install Reserve Power" on page 5-14 for instructions on installing reserve power.

FCC Registration Information

Figure 5-2 Location of Approval Labels

Step 1: Prior to Cabinet Installation

Important! *When wiring optical fiber cable for the RRCU (remote cabinet), make sure the cable bends at >1.18 inches (30mm) radius.*

Step 1A: Assemble Rack

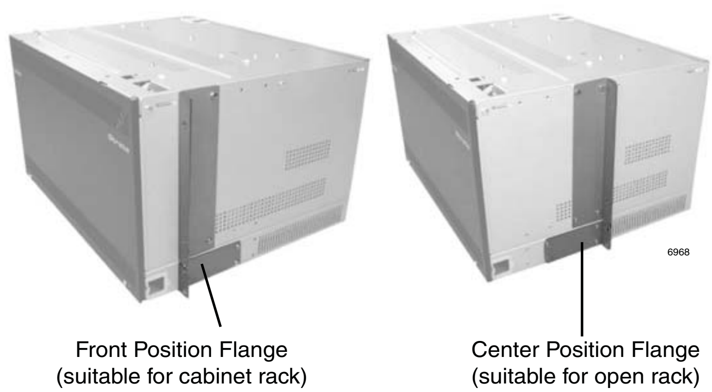
➤ Follow the rack manufacturer's safety instructions when assembling the rack. The rack must be secured to the floor.

CAUTION! Never move a rack by yourself. Due to the weight and height of the rack, at least two people should perform the task.

WARNING! Before installation of the cabinets, make sure that the rack is both level and stable.

Step 1B: Move Flange Position (Optional)

The unit ships with the flange in the front position but it can be moved to a center position (shown below).



Step 2: Install First Cabinet

WARNING! To prevent bodily injury when installing or maintaining these cabinet(s):

- **Because of the weight of the cabinet(s), it is recommended that two people load the rack from the bottom up.**
- **If the rack has stabilizing devices, make sure to install them before installing or servicing the rack mount cabinets.**
- **Do not step or stand on any cabinet when servicing other cabinets in the rack.**

It is recommended you start mounting the bottom cabinet first and then mount the remaining cabinets above the bottom cabinet. The base cabinet can be either the top or bottom cabinet.

You need to plan for any future cabinet additions when you mount the initial configuration. If cabinets will be added in the future they can be added above or below the mounted cabinets.

The following procedures cover both top-down and bottom-up installation.

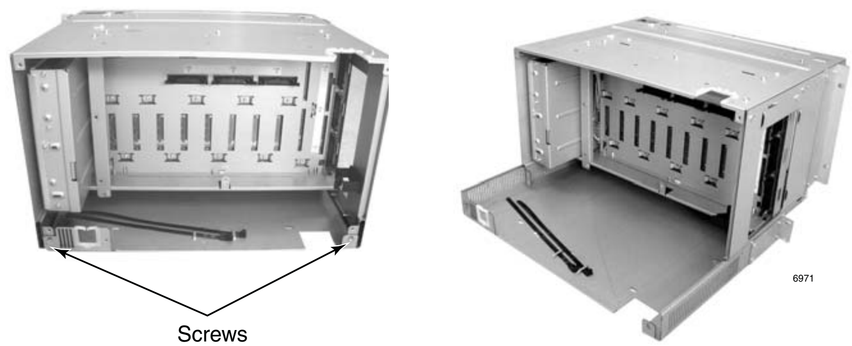
Step 2A: Take Off Front and Back Covers

1. Unscrew the two screws holding the front cover to the unit and slide the cover off.
2. Unscrew the four screws holding the back cover to the unit and take the cover off.

Step 2B: Take Off Base of Cabinet

Important! *If two people are installing these cabinets, you can skip this step and proceed to item 3 under Step 2C.*

➤ Unscrew the two screws holding the base of the cabinet secure and slide the cabinet back off the base (shown below).



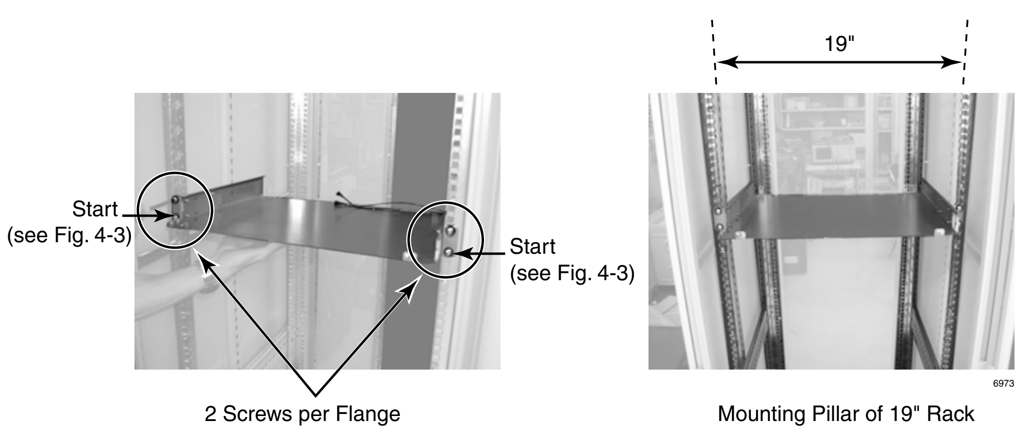
Step 2C: Attach Cabinet to Rack

In order to line up the first cabinet installed in the rack, you must position the bottom-most hole on the flange with the top of two holes on the rack (marked Start on Figure 5-3).

The holes on the rack form a pattern of three-holes. A single hole 5/8” above the previous hole, followed by two holes (1/2” apart) for a total space of 1-1/8”.

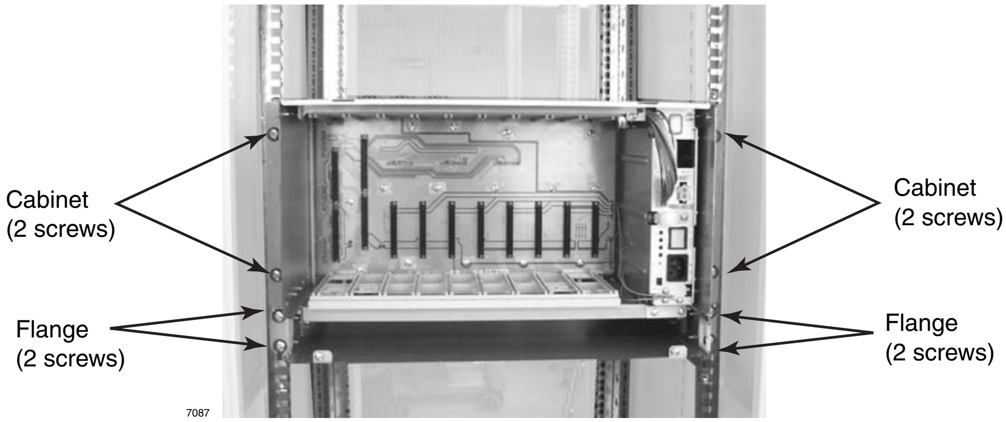
Important! *If you do not start the cabinet installation in one of the holes marked Start in Figure 5-3 on page 5-7, the next cabinet will not match with the holes on the rack.*

1. Attach the base of the cabinet to the rack with two screws on each flange (shown below). Refer to the rack manufacturer’s documentation for screw size. Toshiba does not provide rack screws.



2. Put the cabinet on the base and slide the cabinet back so that it completely covers the base.

3. Screw the cabinet and flange to the rack using four screws on each side (shown below). Refer to the rack manufacturer's documentation for screw size. Toshiba does not provide rack screws.



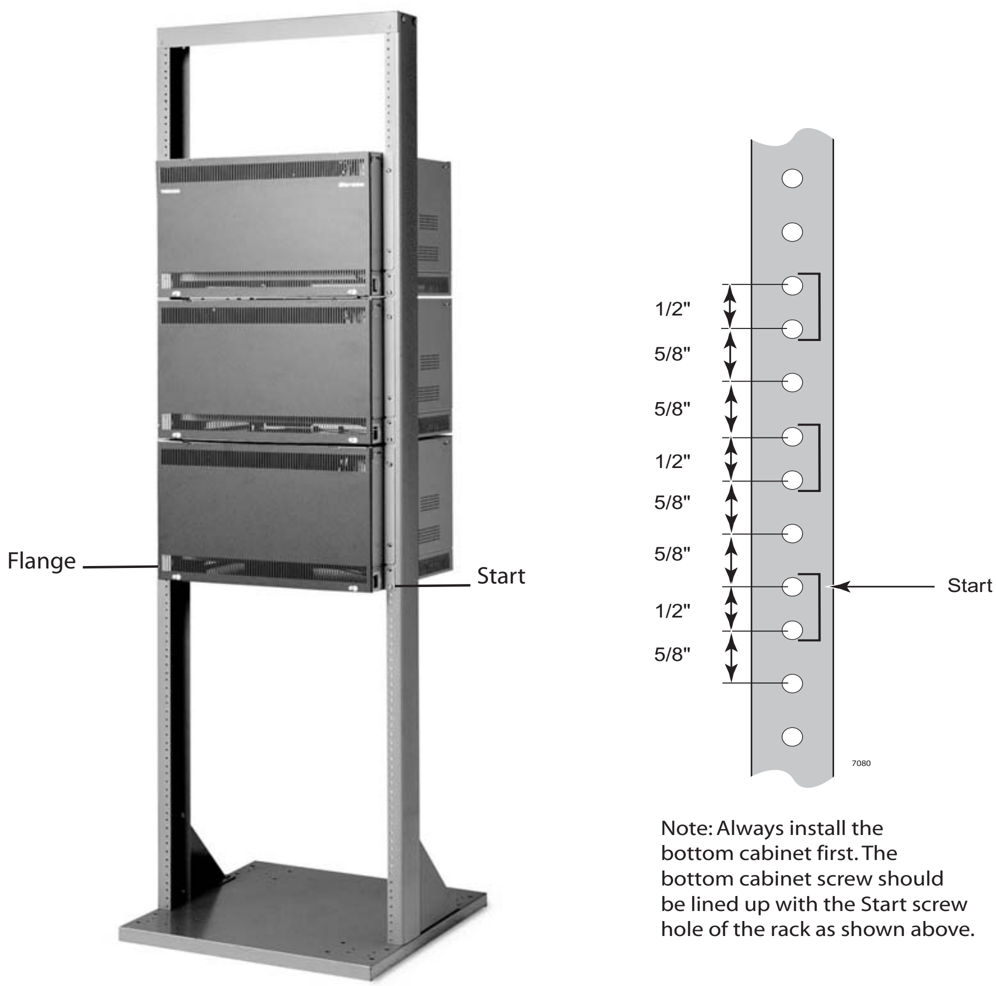


Figure 5-3 Rack Hole Positions

Step 2D: Reattach Cabinet to Base

Note Skip this step if you did not perform Step 2B.

➤ Using the two screws removed in “Step 2B: Take Off Base of Cabinet” on page 6, reattach the cabinet to the base.

Step 3: Install Remaining Cabinet(s)

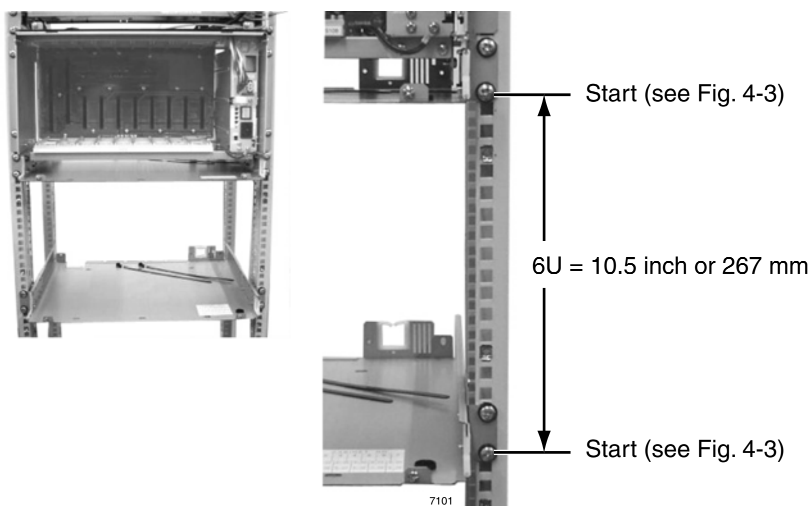
Step 3A: Take Off Front and Back Covers

1. Unscrew the two screws holding the front cover to the unit and slide the cover off.
2. Unscrew the four screws holding the back cover to the unit and take the cover off.

Step 3B: Install and Attach Cabinet(s) to Rack

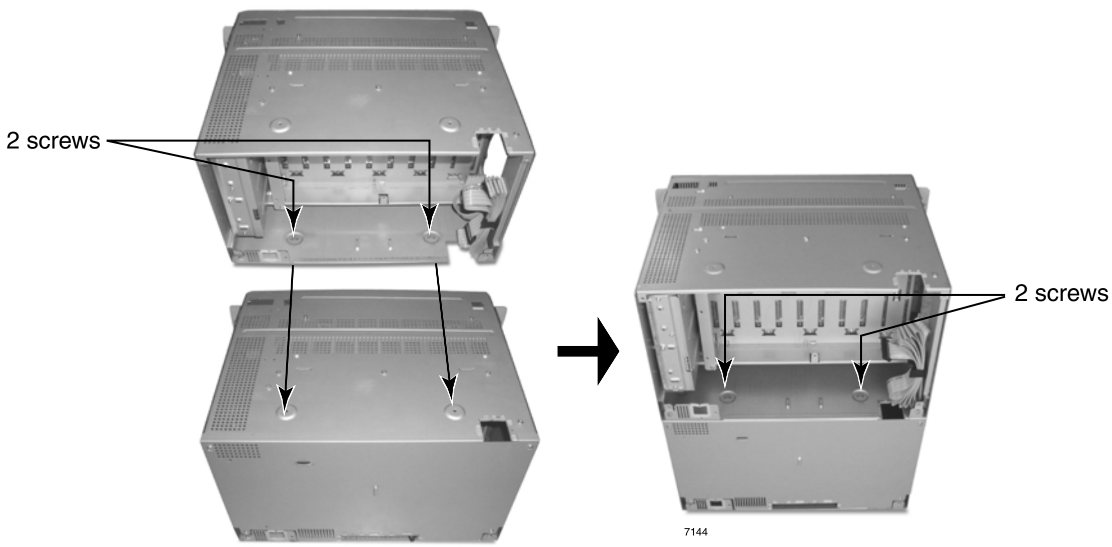
Note See “Step 2C: Attach Cabinet to Rack” on page 5-6 for special instructions on positioning the cabinets before attaching.

1. Place the base of the next cabinet 10.5 inches from the base of the upper base/expansion cabinet (as shown below).



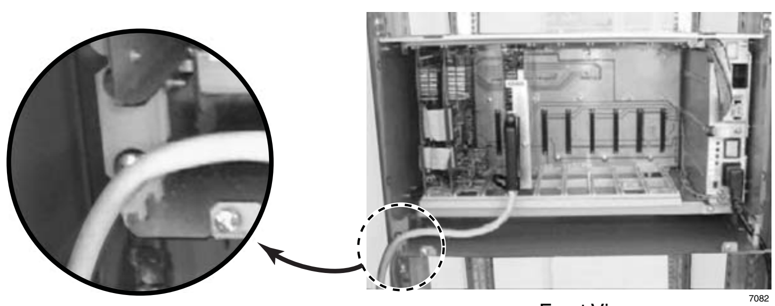
2. Screw the cabinet flange to the rack using two screws on each flange (four total).

3. Attach the upper and lower cabinets with 2 screws (shown below).



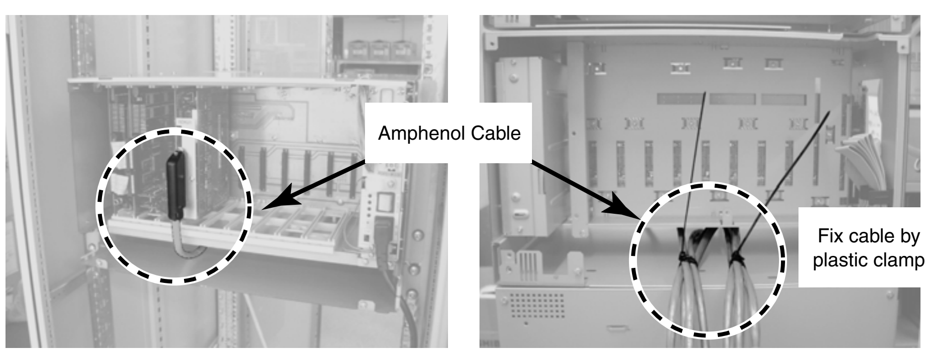
Step 4: Attach Amphenol Cable

➤ The cable can be wired either from the left front (shown below)



Front View

...or the center back (shown below).



Front View   Back View

Step 5: Attach the AC Cable

The Rack Mount Cabinet(s) require a single-phase, 50/60 cycles power source of 120, 208, or 240VAC, on a dedicated 20 ampere circuit breaker. 208VAC or 240VAC is required for six or seven cabinet systems.

Toshiba recommends that a dedicated AC service panel be used. AC outlets must be dedicated to rack mount cabinet use, fused, and grounded. Equipment unrelated to the rack mount cabinet(s) must not be connected to the circuit or service panel dedicated to the rack mount cabinet(s).

Note It may not always be possible to power a complete rack mount cabinet system from a single circuit breaker panel. For example, in the case where a cabinet is remotely located.

To avoid accidental turn-off, do not configure the outlet serving the rack mount cabinets with an On/Off switch. AC outlets serving the cabinets must be close enough so that the power cord from the cabinet power supply or power strip can reach the outlet (these power cords are nine ft.).

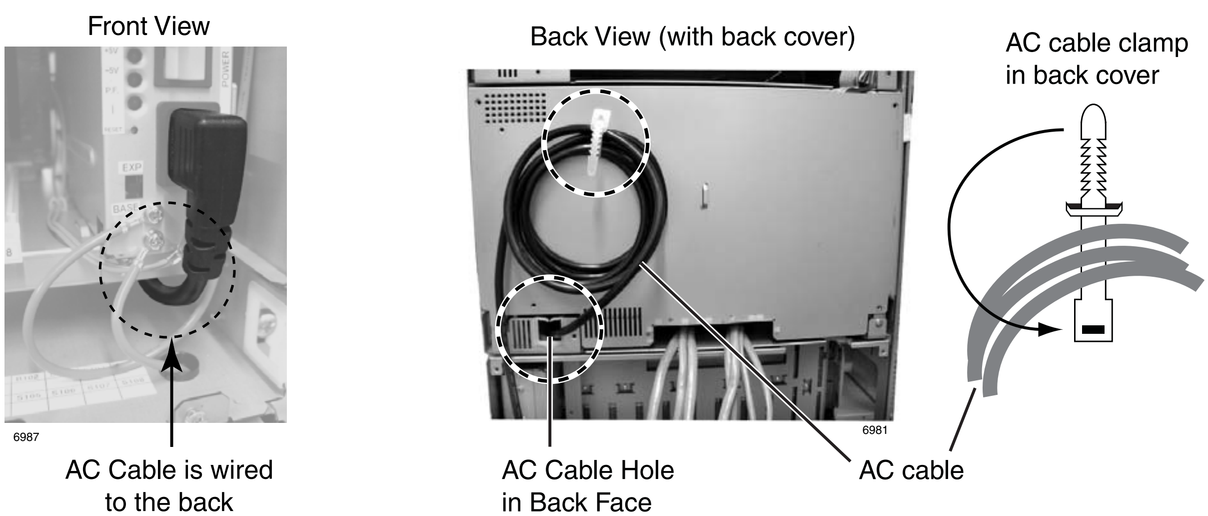
AC wall outlets for the rack mount cabinets must be on dedicated 20amp breakers. AC outlets must meet National Electrical codes specifications: NEMA 5-20R for 120VAC or NEMA 6-20R for 208VAC/240VAC.

AC power cabling requirements vary, depending on: The method of cabinet installation (i.e., rack, floor or wall mount), AC power source voltage (120VAC, 208VAC or 240VAC) and the number of cabinets.

➤ The cable can be wired from the right front of the cabinet (shown right).

...or

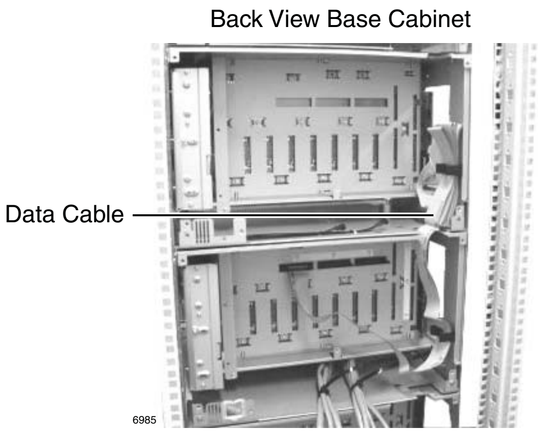
the cable can be wired from the back (as shown below).

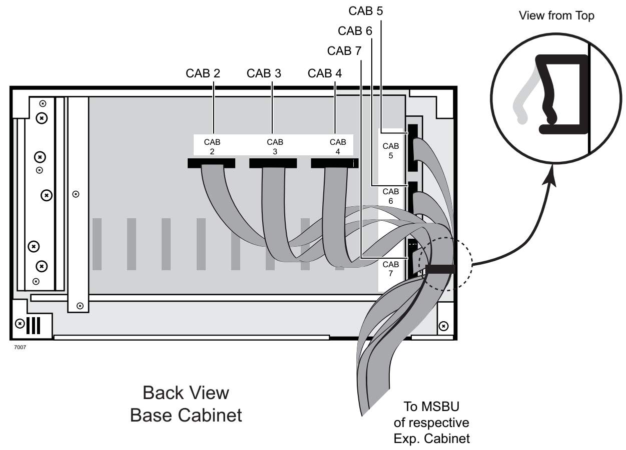


CAUTION! **Arrange the rest of the AC cables outside the cabinet. Noise from the cables influence electrical components (e.g., motherboard) when the cables are located inside the cabinet.**

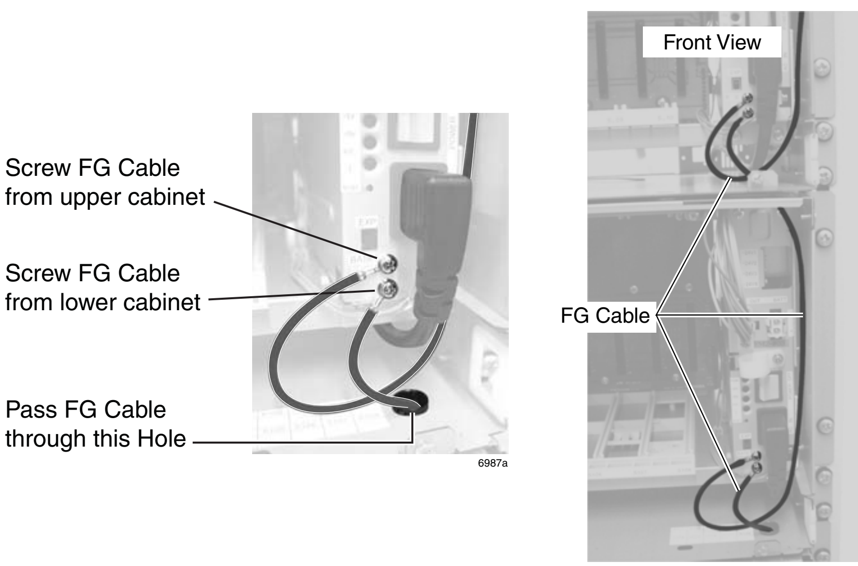
Step 6: Connect Data and Ground Cables

1. Wire the data cable between the base and expansion cabinet (shown below).





2. Wire the FG cable between the base and expansion cabinet by passing it through the hole in the base of the expansion cabinet. Secure the FG wire spade lug to the power supply with the FG screws (as shown below).



Note The backplane FG wires are not safety grounds: they are required for proper system CO line operation.

Step 7: Verify Power Supply Settings

➤ If the cabinet is the Base Unit set the Exp/Base switch to the “Base” position (see “Power Supply Unit (BRPSU672A)” on page 5-28).

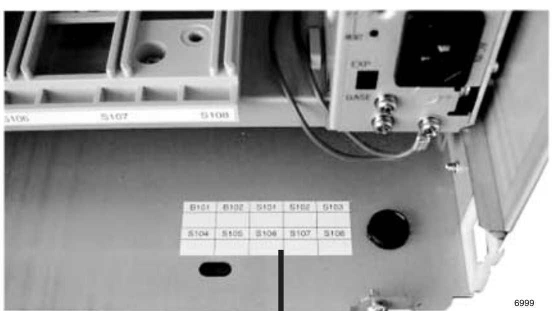
...or if the cabinet is an Expansion Unit, set the Exp/Base switch to the “Exp” position.

Important! *The power supply set as “Base” is the master and has On/Off control over all other power supplies, which are designated as slaves. If the master power supply is turned Off or On, all other power supplies will automatically turn Off or On. (Individual slave power supplies must be turned On.)*

Step 8: Fill Out Slot Assignments

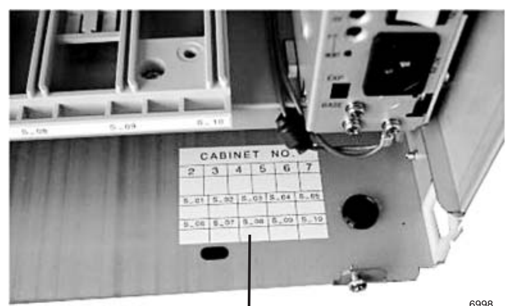
The slot identification label appears on the lower right side of the cabinet interior (shown below).

Base Cabinet



B101	B102	S101	S102	S103
S104	S105	S106	S107	S108

Expansion Cabinet



CABINET NO.					
2	3	4	5	6	7

S_01	S_02	S_03	S_04	S_05
S_06	S_07	S_08	S_09	S_10

Step 9: Attach Mesh Tie (B50MT)

➤ Wrap the cables in with the mesh tie. The purpose of the wrap is to shield the cables from EMI/RFI effects. See Figures 5-6, 5-7 and 3-10 for additional information.

Note One mesh tie is required to wrap cables individually in each cabinet. One mesh tie is required to wrap all cables where they exit the system. A B50MT Mesh Tie is included with each base and expansion cabinet.

Step 10: Install Power Strip (BRPSB120A)

➤ Using 2 screws attach the BRPSB120A to the back cover of the expansion cabinet (as shown at right).

See also Table 5-3, "Power Cabinet Hardware for Rack Mount Cabinets" on page 5-24 for additional information.

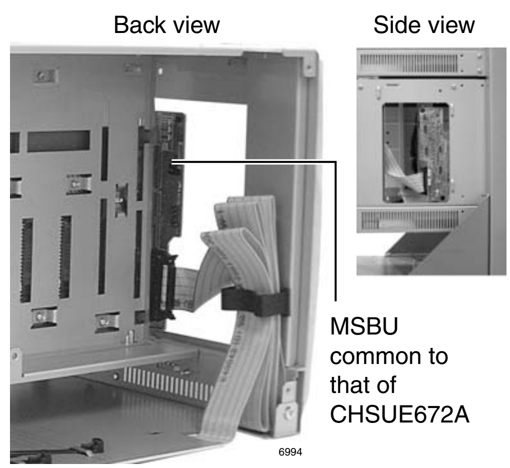
Step 11: (Optional) Install Power Strip (BRPSB240A)

Note If you are installing 4 or more cabinets, you must use the BRPSB240A power strip. See page 5-30 for additional requirements.

➤ Using 2 screws attach the BRPSB240A to the back cover of the expansion cabinet (as shown at right).

See also Table 5-3, "Power Cabinet Hardware for Rack Mount Cabinets" on page 5-24 for additional information.

Important! *You can disconnect the MSBU and reconnect it to the back side of the expansion cabinet to make it easier to perform maintenance (shown right).*



Rack Mount Cabinets

Step 12: (Optional) Install Reserve Power

Two or four customer-supplied, 12VDC batteries (80 amp hours maximum) can be connected to the system as a power failure backup. In the event of a power failure, the system automatically switches over to battery power without any interruption to existing calls or other normal system functions.

The procedure for installing reserve power varies, depending on the number of cabinets in the system. The following text details reserve power battery installation requirements.

Important! *Batteries must be connected when normal AC power is available; they cannot be connected during an AC power failure situation.*

The length of time reserve power operates depends on the system, size and number of batteries provided, and the system load. Typical reserve power duration estimates and battery specifications are estimated with the following considerations (see Table 5-1):

- Batteries have full charge at start of operation.
- Two or four batteries connected per Figure 5-4.
- Batteries are 12VDC, rated at 80 amp/hours each.
- System is operating at full load traffic with LCD phones.
- Batteries used for this test are gel-cell and maintenance-free. Reserve duration will vary depending upon battery type, age, and manufacturer. These figures should only be used as an estimate.

Table 5-1 Typical Reserve Power Duration Estimate

Number of Cabinets	1	2	3	4	5	6	7
Estimated operation time Two-battery configuration	12.0 hrs.	6.0 hrs.	4.0 hrs.	3.0 hrs.	2.5 hrs.	2.0 hrs	1.8 hrs
Estimated operation time Four-battery configuration	24.0 hrs.	12.0 hrs	8.0 hrs	6.0 hrs.	5.0 hrs.	4.0 hrs	3.5 hrs

WARNING! Some batteries can generate explosive gases. Therefore, ensure that batteries are located in a well-ventilated area.

Do not smoke near batteries.

Avoid creating any electrical sparks near batteries.

Use commercially available battery enclosures to reduce risk to nearby people and equipment.

Reserve Battery Cabinet Components/Cables

WARNING! Battery cables that exit the cabinet(s) are not UL listed because of possible incorrect installations. Have a licensed electrician install these cables.

The part names and descriptions of the reserve battery cabinet components and cables are shown in Table 5-2.

Table 5-2 Reserve Battery Cabinet Components/Cables for Rack Mount Cabinets

Option	Description
PBTC1A-3M	A three-meter long battery cable is used to connect reserve power batteries to the system power supply when the system has less than three cabinets. One reserve power cable is required for each cabinet in a one or two cabinet system. The cable connects the Strata rack cabinet power supply directly to the battery terminals (a BBDB1A is not required).
BBDB1A	Strata CTX reserve power battery distribution box is required when connecting reserve power batteries to three or more cabinets. The box is field installed into one of the Strata CTX cabinet side panels. The BBDB1A provides seven BBTC2A-2.0M, battery distribution cables to connect reserve power from the BDDB1A box to each individual cabinet power supply. One or two BBTC1A-2.0M must be ordered separately when using the BBDB1A battery distribution box.
BBTC1A-2.0M	A two-meter battery cable used to connect reserve power batteries to the BBDB1A battery distribution box. One reserve power cable is required in a three or four cabinet system and two cables are required for five, six or seven cabinet systems. The cable connects Strata CTX BBDB1A box directly to the battery terminals.

Important! *Reserve batteries can be installed in various configurations depending on backup time (Table 5-1) and the number of cabinets (Figure 5-4). Use the guide in Figure 5-4 for installing batteries, as required.*

Install Reserve Power for One or Two Cabinets

1. Connect the black jumper wire (supplied with the PBTC1A-3M cable) from the positive terminal of one 12VDC battery to the negative terminal of the second 12VDC battery (Figure 5-4).
2. Ensure that a serviceable 10-amp fuse is installed in the in-line fuse holder of the PBTC1A-3M cable.
3. Connect the PBTC1A-3M battery cable white lead to the open positive terminal of the 12VDC battery. Connect the black lead to the open negative terminal of the second 12VDC battery.

Important! *The cabinet(s) must be connected to the (live) AC power source, and the power supply On/Off switch set to On prior to the final step of connecting the reserve power batteries to the power supply via the BATT+/- receptacle. If the batteries are connected after AC power is lost, reserve power will not function.*

4. Connect the PBTC1A-3M battery cable two-prong male plug to the Base Cabinet power supply BATT +/- receptacle.
5. Repeat Steps 3 and 4 to connect a PBTC1A-3M to the Expansion Cabinet.
6. To test reserve power operation, disconnect system AC power plugs with power supply On/Off switches in the On position. The system should continue to operate without interruption.

Note If connecting four batteries, follow the wiring diagram in Figure 5-4.

Install Reserve Power for Three or More Cabinets

1. Install the Battery Distribution Box (BBDB1A). See “Install Reserve Power Battery Distribution Box (if required)” on page 5-17 and Figure 5-4. The BCCB is not required.
2. Connect two Cable “C” jumper wires from the positive terminal of one 12VDC battery to the negative terminal of the second 12VDC battery, per Figure 5-4 (Cable “C” is supplied with the BBTC1A-2.0M cable).
3. Ensure that a serviceable 15-amp fuse is installed in the in-line fuse holder of the BBTC1A-2.0M battery cable.
4. Connect the white lead of the BBTC1A-2.0M battery cable to the open positive terminal of the 12VDC battery. Connect the black lead to the open negative terminal of the second 12VDC battery.
5. Connect a second BBTC1A-2.0M in parallel to the first BBTC1A-2.0M cable per Steps 2, 3 and 4.
6. Plug the two BBTC1A-2.0M battery cables into the Battery Distribution Box.

Important! *The cabinets must be connected to the (live) AC power source, and the power supply On/Off switches set to On prior to the final step of connecting the reserve power batteries to the power supplies via the BATT +/- receptacle. If the batteries are connected after AC power is lost, reserve power will not function.*

7. Connect the BBTC2A-2.0M cables from the Battery Distribution Box to the BATT +/- receptacle of individual power supplies per Figure 5-4 (BBTC2A-2.0M cables are supplied with a BBDB1A distribution box).
8. To test reserve power operation, disconnect the system AC power plugs with the power supply On/Off switches in the On position. The system should continue to operate without interruption.

Note If connecting four batteries, follow the wiring diagrams in Figure 5-4.

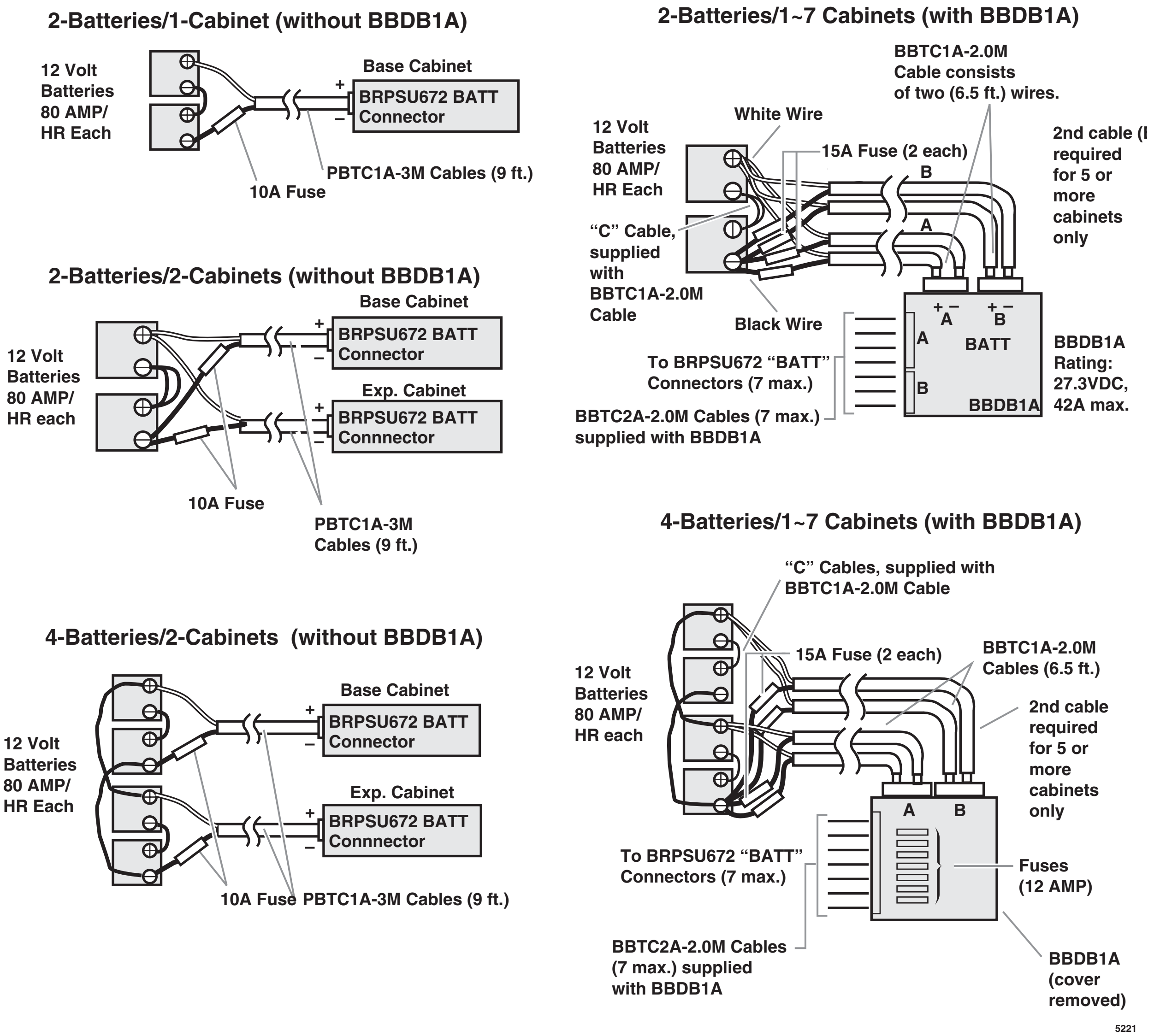


Figure 5-4 Battery Wiring Diagram (Two or Four Batteries)

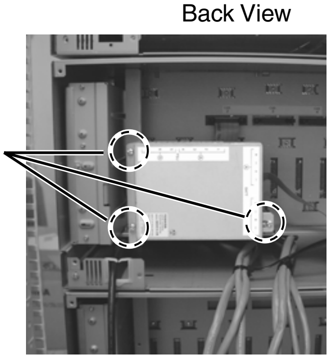
Install Reserve Power Battery Distribution Box (if required)

If a BBDB1A is required (see Figure 5-4), follow this procedure:

➤ Using 3 screws attach the BBDB1A (as shown at right) to an expansion cabinet somewhere in the middle of the system.

Back View

Using 3 screws attach the BBDB1A



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Notes

- The BBDB1A can also be installed in the base cabinet.
- With a 7 cabinet installation, do not install the BBDB1A in the top or bottom cabinet.
  The 6.56 ft. (2m) BBTC2A-2.0M cables are not long enough to reach from the bottom cabinet to the top cabinet

Step 13: Ground the System

The system requires a solid earth ground for proper operation and safety. The AC power cord(s) already contains a conductor for the “third wire ground” provided by the commercial power outlet (see Figure 5-5, for grounding points “A” and “B”). An insulated conductor must connect the frame ground terminal on the Base Cabinet to a cold water pipe or the building ground (point “B”).

Before connecting the system to the AC power source, measure the impedance of the building ground reference. If the ground path connected to the system has an impedance of 1 ohm or more, a better ground must be installed. In Figure 5-5, the grounding path between point “A” and the single point ground “B” must be less than 0.25 ohms.

The “third wire ground” coming from the primary AC power outlet must be dedicated and must be routed through the same conduit as the phase conductors serving the system. The conductor connected to the frame ground (FG screw) on the system power supply must be insulated and comply with the general rules for grounding contained in Article 250 of the National Electrical Code, NFPA 70, but must not depend on the cord and plug of the system.

If the CTX670 system consists of more than one cabinet, you must install the bonding connection plates that come attached to each expansion cabinet. Refer to Figure 5-5. Connect the mother board ground wires and the intercabinet ground wires per Figure 5-5.

On each cabinet, wrap the cable mesh shield (part No. B50MT) around the 25-pair communication cables that carry stations over tip and ring, per Figures 5-6 and 5-7.

WARNING! **Failure to provide a proper ground may be a safety hazard to service personnel or lead to confusing trouble symptoms. In extreme cases, system failure may result because the system is not properly protected from lighting or power transients.**

Step 14: Install Processor and Universal PCBs

See section entitled “Install Processor and Universal PCBs” on page 4-43.

Step 15: Attach Front and Back Covers

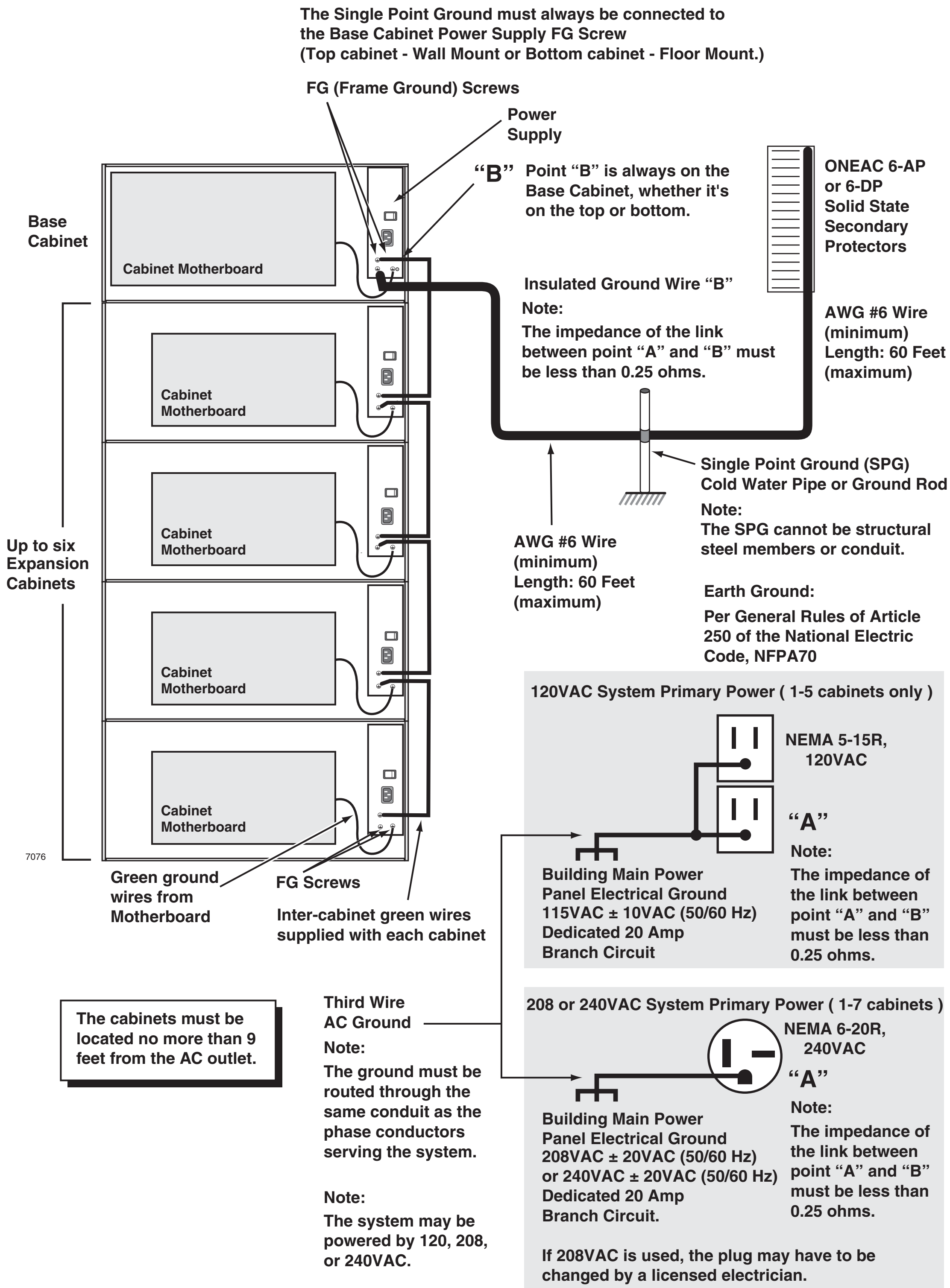


Figure 5-5 Rack Mount Cabinet Grounding

Wiring for 7 Cabinet Configuration

The following illustrations show an overview of the cabling for a 7 cabinet configuration.

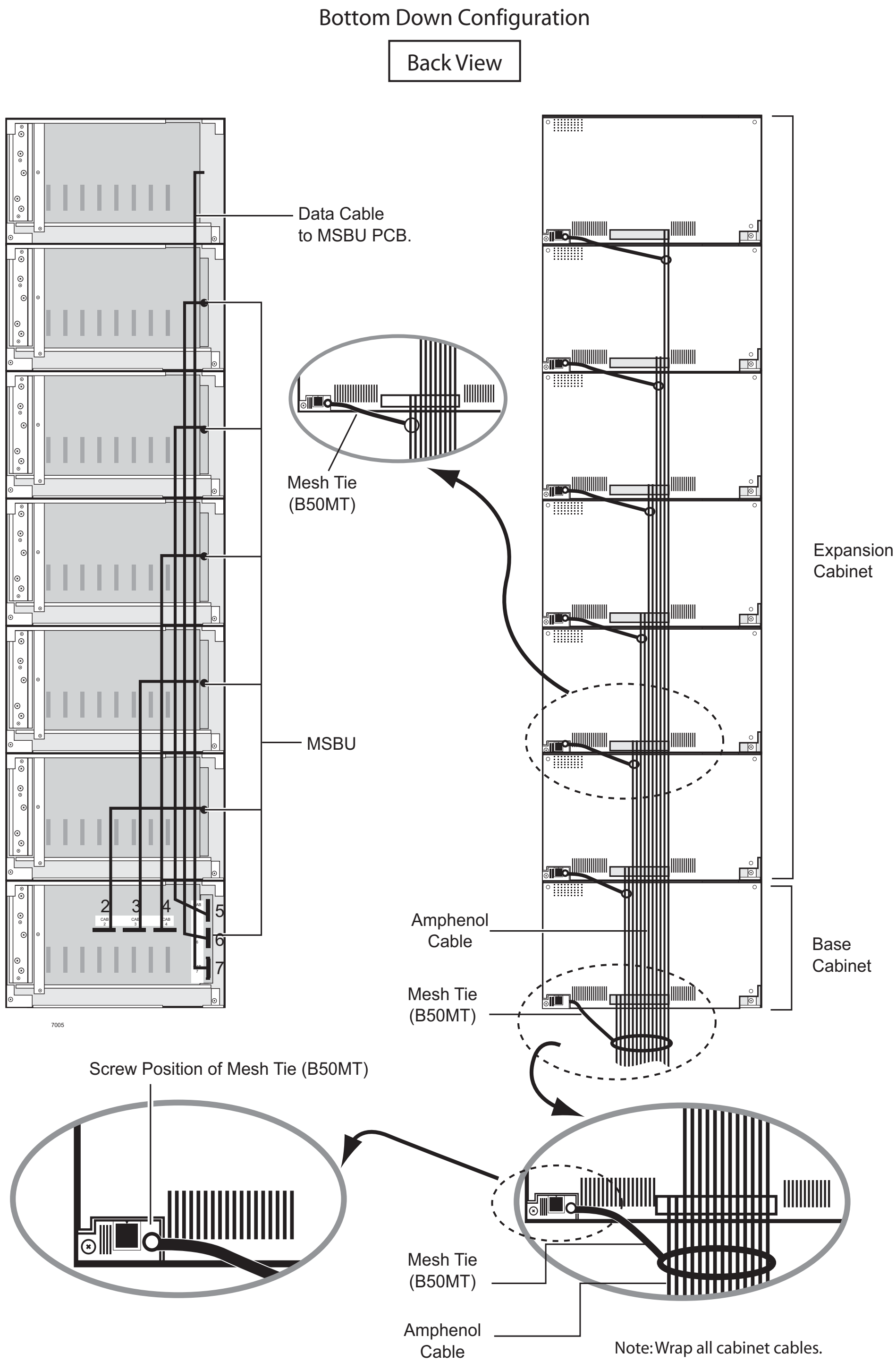


Figure 5-6 Bottom Up Configuration (Center back wiring)

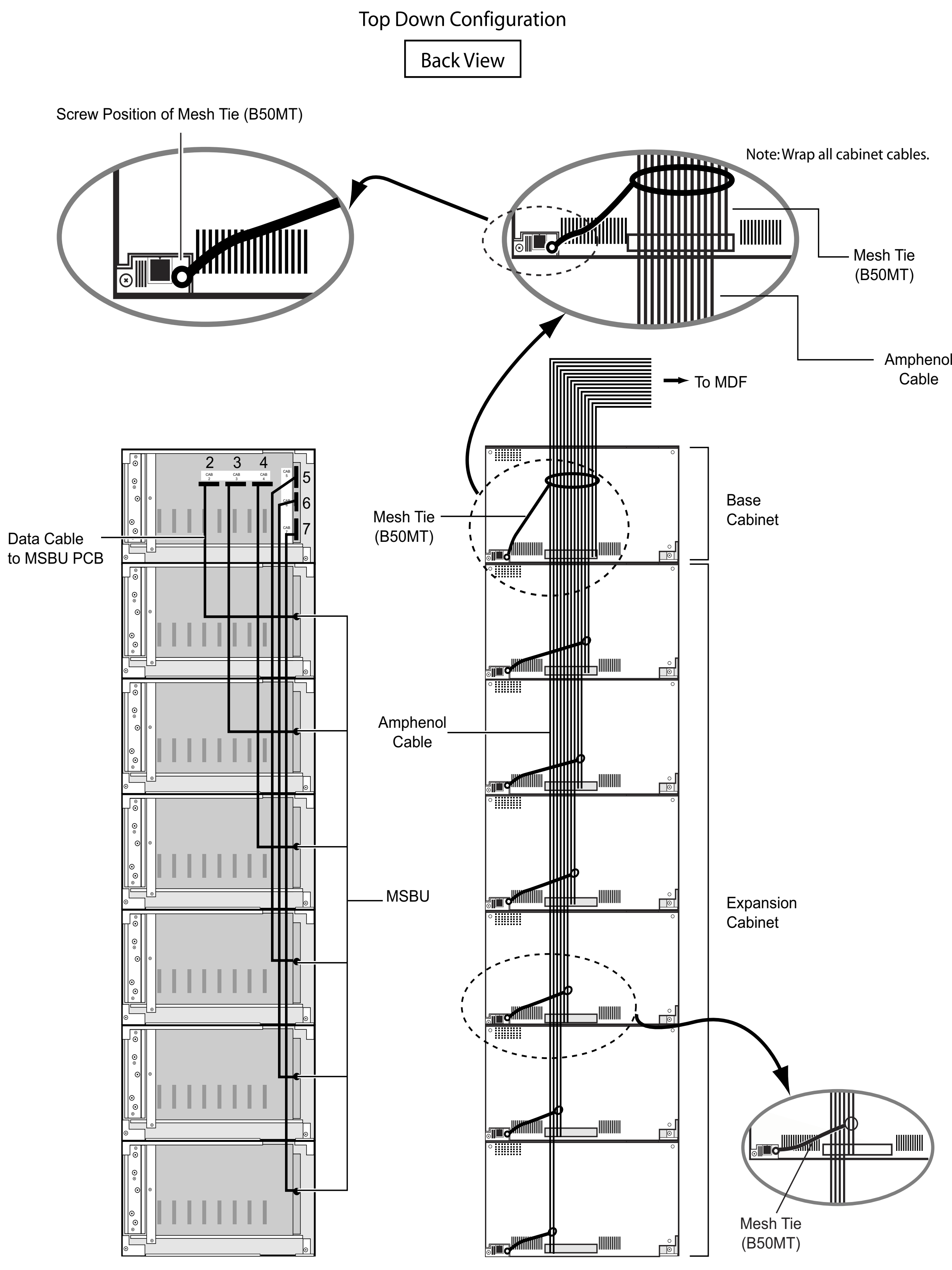


Figure 5-7 Top Down Configuration (Center back wiring)

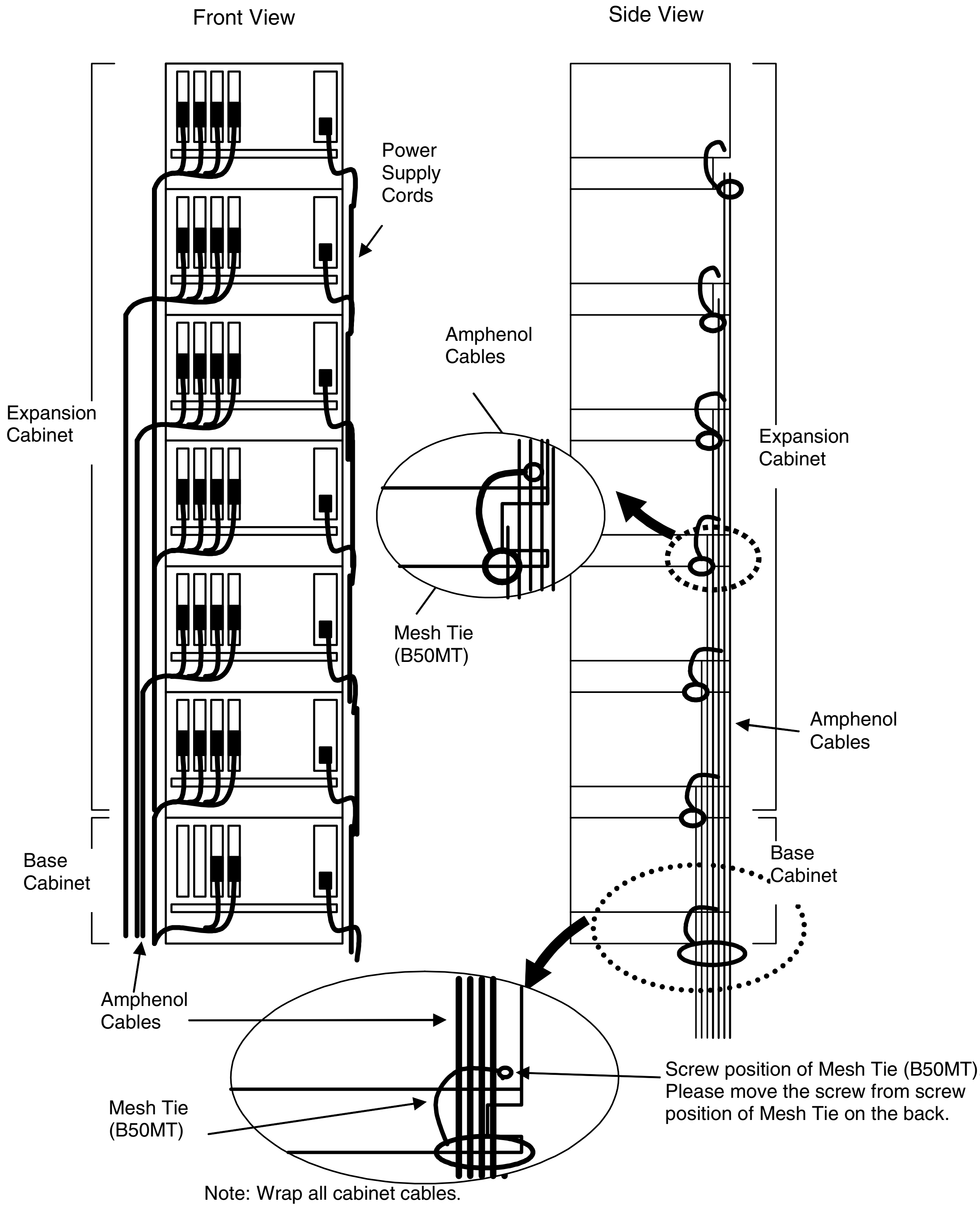


Figure 5-8 Bottom Up Configuration (Left Front wiring)

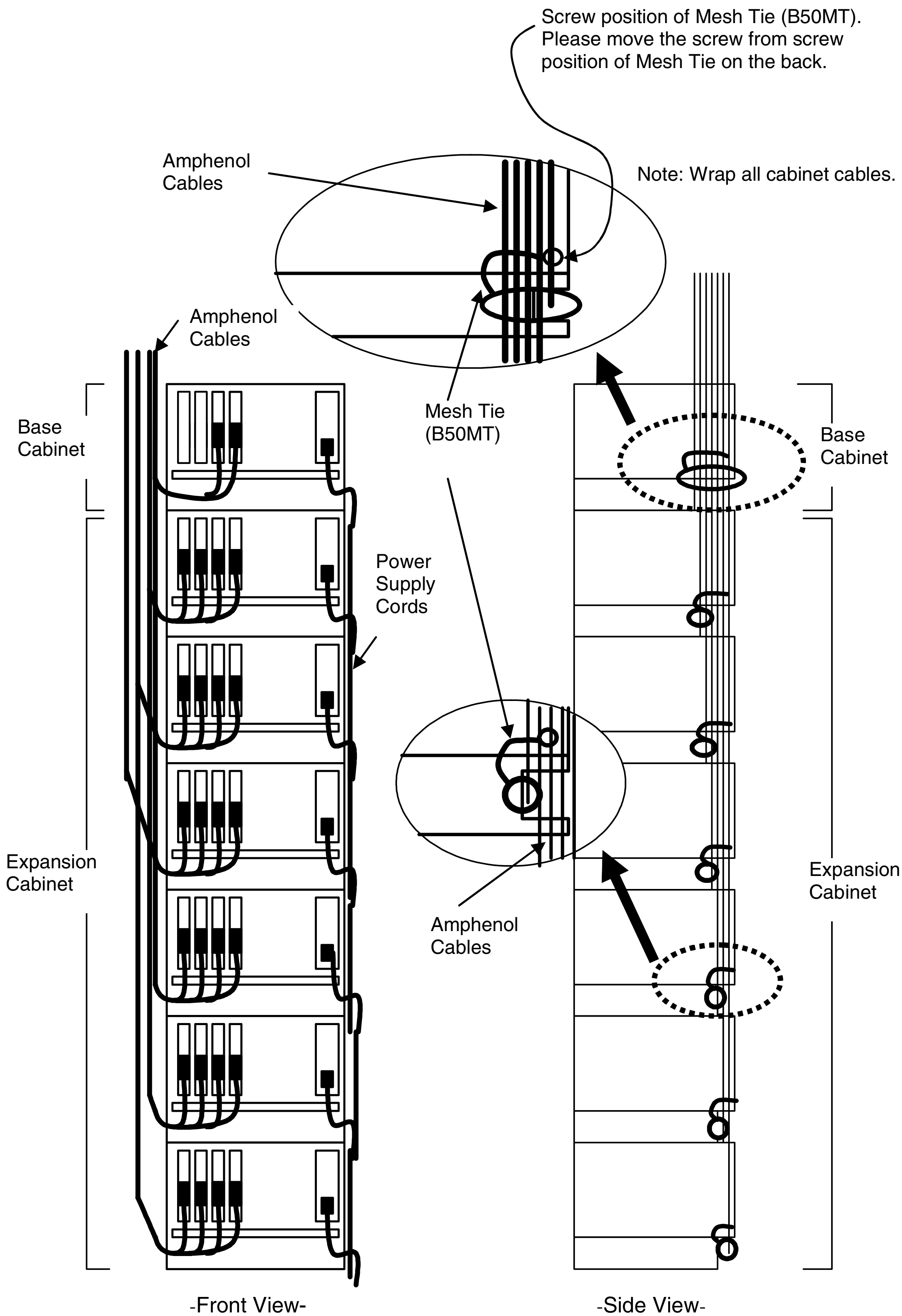


Figure 5-9 Top Down Configuration (Left Front wiring)

Primary Power Cabinet Hardware

The type of cabinet mounting can have an effect on the power requirements. Underwriters' Laboratory (UL) and local electrical codes require certain standards for connecting commercial AC and reserve power to the Strata CTX system. Table 5-3 describes which assemblies may be required to meet UL and local electrical code standards.

Table 5-3 Power Cabinet Hardware for Rack Mount Cabinets

<table>
<tr><th>Option</th><th>Description</th></tr>
<tr><td>BRPSB120A</td><td>Cabinet power strip for 120VAC primary power – provides three standard 120VAC/15A outlets (NEMA5-15R) and nine ft. AC power cord with standard 120VAC/15A plug (NEMA5-15P). This unit is field installed outside the system cabinet on the back cover. The system can use 12 amps. (max.).
One BRPSB120A is required for two cabinet systems if the local electric code allows only one AC power cord to be connected to the system.
Note If the local electric code allows only one AC power cord to be connected to the system, 208VAC or 240VAC must be used as primary AC power for systems with four or more cabinets.
One BRPSB120A is required for a three or four cabinet system if the local electric code allows two AC power cords connected to the system.
Two BRPSB120As are required for a five cabinet system if the local electric code allows two AC power cords connected to the system.</td></tr>
<tr><td>BRPSB240A</td><td>Cabinet power strip for 208VAC or 240VAC primary power - provides three 240VAC/20A outlets (NEMA 6-20R) and 9ft. AC power cord with a standard 240VAC/20A plug (NEMA 6-20P). This unit is field installed outside the system cabinet on the back cover. The system can use 16 amps. (max.).
One BRPSB240A is required for two or three cabinet systems.
Two BRPSB240As are required for four or five cabinet systems.
Three BRPSB240As are required for six or seven cabinet systems.
Note
• Local electric codes allow only one AC power cord to be connected to the system when using 208VAC or 240VAC as the primary AC power.
• BRPSB240A conforms to the National Electric Code standards. If using 208VAC as primary power, the plug on the BRPSB240A AC power cord that exits the cabinet (NEMA 6-20P) may have to be changed to a twist-lock type by a certified electrician to conform with local electric codes.</td></tr>
<tr><td>BACL240A</td><td>AC208V or AC240VAC nine ft. power supply cord. The cord is rated at 10 amps. (max.) and must be used when the system is powered by 208VAC or 240VAC. One cord is required for each cabinet power supply and must be ordered separately only if using 208VAC or 240VAC as the system primary AC power.
Note The cord is equipped with a 250VAC/20A plug (NEMA 6-20P) which is standard for 240VAC. If using 208VAC as the system primary power this cord may have to be changed by a certified electrician for one or two cabinet installations. If using three or more cabinets, a BRPSB240A power strip is required and the power strip plug may have to be changed by a certified electrician depending on local electric codes.</td></tr>
</table>

AC/Reserve Power and Data Cabling Overview

Figures 5-10 and 5-11 show an overview of the AC power and data cabling for the Rack Mount Cabinets. Detailed illustrations of AC power strips and cords are on the following pages.

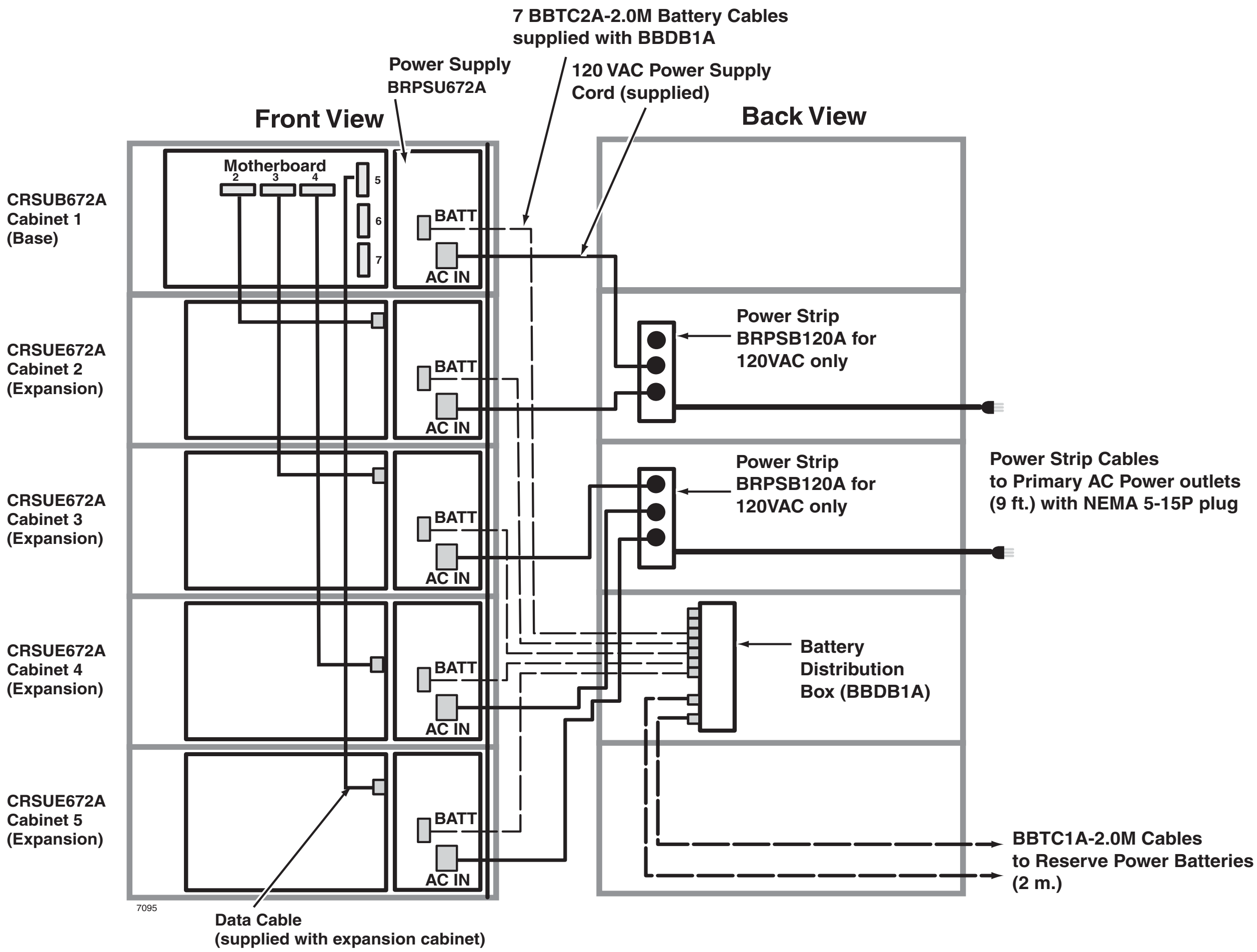


Figure 5-10 120VAC Power/Data Cabling for up to Five Cabinets

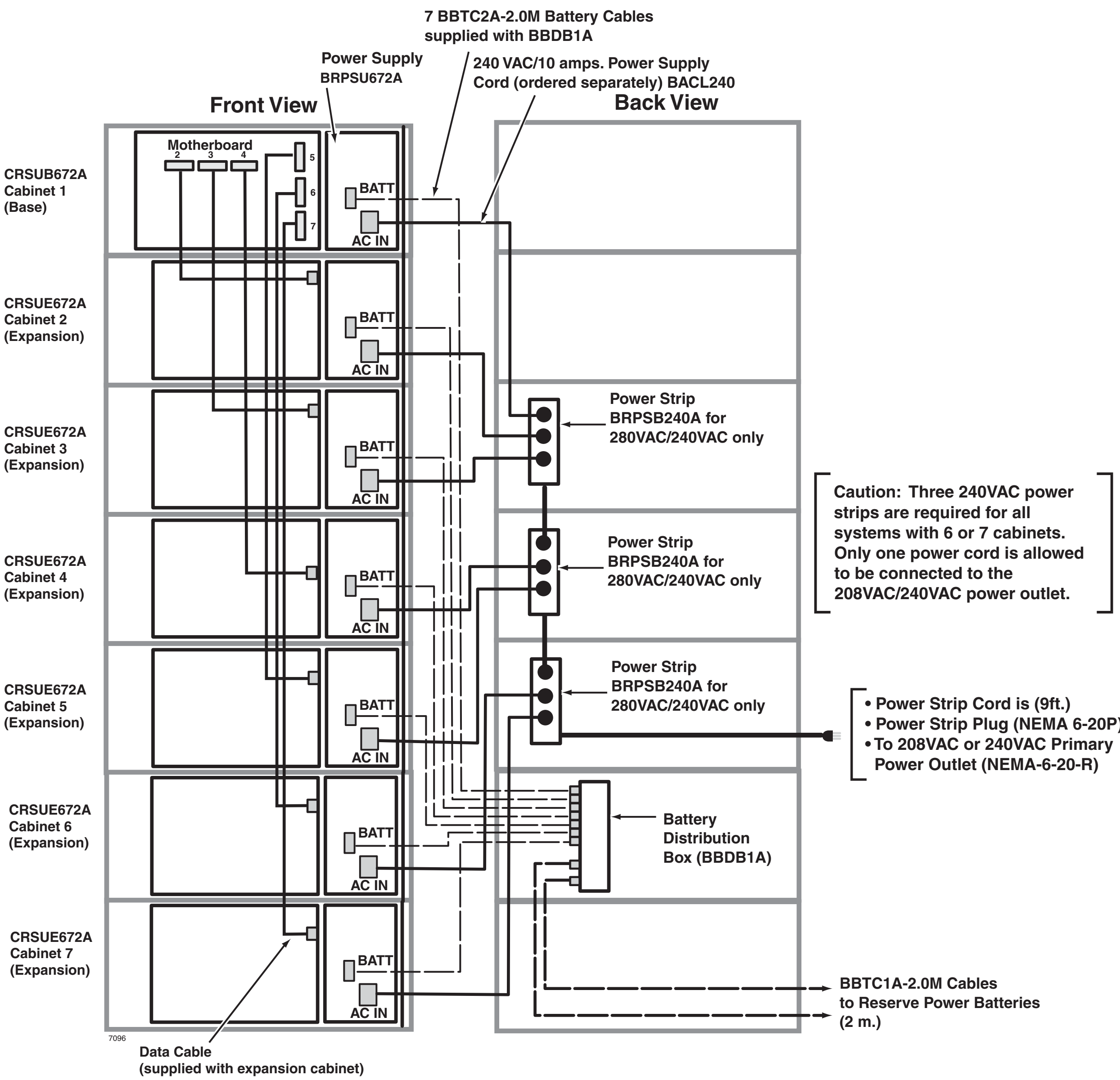


Figure 5-11 208VAC/240VAC Power/Data Cabling for up to Seven Cabinets

Cabinet AC Power Considerations

The rack mount cabinet power supply works with either 120VAC, 208VAC or 240VAC. The rack mount only requires 120VAC (up to three cabinets if one AC cord is allowed or five cabinets if two AC cords are allowed – see below).

If the system has more then five cabinets, 208VAC or 240AVC is required for the primary AC power source. 208VAC or 240VAC can always be optionally used for systems with five or less cabinets for future growth or, if the electrical code requires.

To determine AC power requirements, you need to check local electrical code requirements for 120VAC, 208VAC or 240VAC primary power. Some electrical codes stipulate that:

- 208VAC or 240VAC is required for telephones systems
- Only one electrical cord can connect to the telephone system.
- Only two electrical cords can connect to the telephone system.
- No electrical cord can connect to the telephone system – must use conduit wiring installed by a certified electrician (example: when system is floor mounted).

AC Power Component Requirements

Table 5-4 show the cabinet parts required to distribute AC power for various configurations of the Strata CTX cabinets.

Table 5-4 Rack Mount Cabinet Power Component Requirements for 120VAC Primary Power

Local Electrical Code	Cabinets						
	1	2	3	4	5	6	7
Allows only one 120VAC power cord from system	0 BRPSB120A	1 BRPSB120A	1 BRPSB120A	N/A	N/A	N/A	N/A
Allows two 120VAC power cords from system	0 BRPSB120A	0 BRPSB120A	1 BRPSB120A	1 BRPSB120A	2 BRPSB120A	N/A	N/A

- One dedicated, isolated, 20 amp. AC circuit breaker with dual outlets is required.
- N/A= If the system contains more than three cabinets and if the local code allows only one AC cord, the system requires a BCCB120 conduit box wired by a certified electrician when using 120VAC as primary power. Otherwise, 208VAC or 240VAC should be used as the primary power source (see cabinet power options listed below). If more than five cabinets are installed, 208VAC or 240VAC is required.

Table 5-5 Rack Mount Cabinet Power Component Requirements for 208VAC or 240VAC Primary Power

Local Electrical Code	Cabinets						
	1	2	3	4	5	6	7
Allows One AC power cord from system	1 BACL240A	1 BRPSB240A 2 BACL240A	1 BRPSB240A 3 BACL240A	2 BRPSB240A 4 BACL240A	2 BRPSB240A 5 BACL240A	3 BRPSB240A 6 BACL240A	3 BRPSB240A 7 BACL240A

Important! *The plugs and wall receptacles required by the local electrical code might differ for 208VAC and 240VAC. Thus in some areas of the U.S., the plug used on the Toshiba 240VAC power strip and 240VAC power supply cord (NEMA code 6-20P) can not be used for 208VAC installations. In this case, when using 208VAC, the AC plugs on the BPSB240 power strip cord that connects directly to the 208VAC wall outlet must be changed by a certified electrician per the local electrical code.*

Power Supply Unit (BRPSU672A)

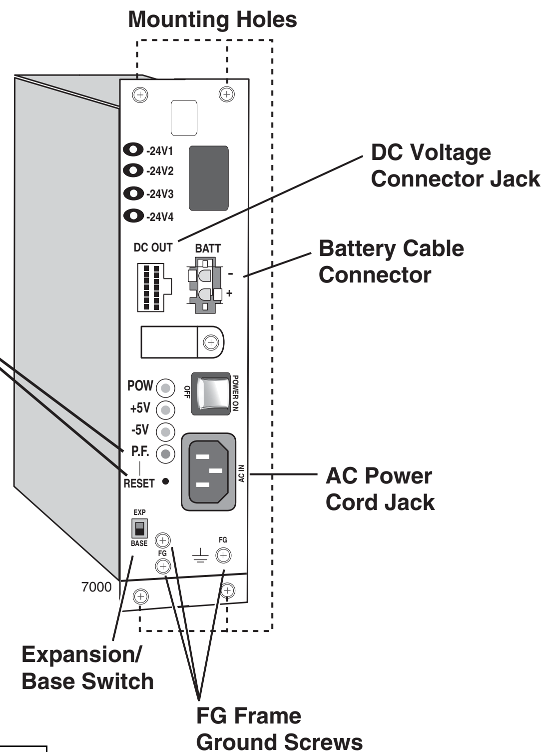
The BRPSU672A Power Supply Unit (shown below) comes factory installed in each Rack Mount Base and Expansion Cabinet. It furnishes power to all of the stations and some of the peripherals that interface with the cabinet.

The BRPSU672A automatically detects and adjusts for the type of AC voltage (120/208/240) to which it is connected.

24V Circuit Breaker Assignments:

Base Cabinet	
24V-1	S101, S102
24V-2	S103, S104
24V-3	S105, S106
24V-4	S107, S108

EXP. Cabinet	
24V-1	S_01, S_02
24V-2	S_03, S_04
24V-3	S_05, S_06, S_07
24V-4	S_08, S_09, S_10



DC Voltage Specification		
+5V (+4.5 ~ +5.5), 4.0 amps	BATT (Volts)	
-5V (–4.5 ~ –5.5), 0.8 amps Expansion Cabinet only	+	0
-24V (–26.3 ~ –27.8), 6.0 amps	–	–26.3 ~ –27.8 [2]

1. Back Plane DC Voltage Plug must be plugged into Power Supply when checking voltages.
2. On BRPSU672, the BATT output is 0 volts unless connected to good batteries.

DC Voltage Connector Plug Pin Wires						
Yellow	**Blue**	**White**	**Green**	**Green**	**Green**	**Red**
-24	-5	+5	0	0	0	+5
Yellow	**Yellow**	**Yellow**	**Green**	**Green**	**Green**	**Red**
-24	-24	-24	0	0	0	+5

Figure 5-12 Power Supply Unit (BRPSU672A)

Check the Power Factor Indicator and Reset Button

The front panel of BRPSU672A provides a Power Factor LED and Reset button. If the cabinet power factor is exceeded by overload of PCBs, the PF LED will turn on.

➤ If the PF LED indicator turns on, press the PF reset button with a pointed tool or pencil. If the PF LED turns off and does not turn on again it may have been turned on by a current surge while installing a PCB while the power supply was turned-on.

➤ When a PF alarm is indicated, check that the cabinet power factor is not exceeded using the "Worksheet 7 – System Power Factor Check" on page 2-42. If the Power factor has been exceeded relocate any PCBs that are causing the PF to be exceeded.

Check the -24 Volt Circuit Breakers

The BRPSU672A provides four -24v circuit breakers as shown in figure above. If a low resistance between –24 volts and ground exists the circuit breaker will trip. Usually the front panel DC green LED indicator will turn off but not always. Also if AC power is recycled the DC LED indicator may turn back on – even if the –24 volt circuit breaker is tripped.

Circuit Breaker Location and Slot Assignments

- The circuit breaker 24V1~24V4, located directly below DC-out cable, protects the cabinet slots as shown in the Circuit Breaker assignment table.

Reset Circuit Breaker

1. A defective PCB or an external short on the MDF may cause the circuit breaker to trip.
2. If you suspect that a –24 volt circuit breaker has tripped, try to reset it by:
    - Turn the power supply DC power switch off and unplug the power supply AC power cord from the AC outlet – the inside of the power supply has exposed voltages.
    - Gently press in each circuit breaker and listen for or try to feel it click. If the breaker was tripped, you will hear or feel it click back to the set position.
    - If the circuit breaker resets, pull the PCBs and check for MDF shorts associated with the slots assigned to the tripped circuit breaker. Remove any defective PCBs and MDF shorts.
    - Restore power and verify the system is working normally.
3. Replace the power supply if the circuit breaker continues to trip and a defective PCB or short cannot be found.

Changing Plug for Power Strip BRPSB240A

You must use a 240VAC power strip (BRPSB240A) if only one AC power cord is connected to a system with four or more cabinets.

Most 240VAC wall outlets and UPS systems (ONEAC or other) have twist locks. Twist locks are mostly used at the wall outlet or UPS to prevent accidental unplugging.

If you are plugging the Strata rack mount power strip (BRPSB240A) into a twist lock outlet/UPS, you will need to change the power strip plug that exits the cabinets to a twist lock plug.

Important! *Only the 240VAC power strip that exits the cabinets (see page 5-33) should be changed.*

This procedure shows how to change the one plug on the power strip (shown right).

Recommended parts: Pass & Seymour, L620-P (NEMA Config. No. L6-20P).

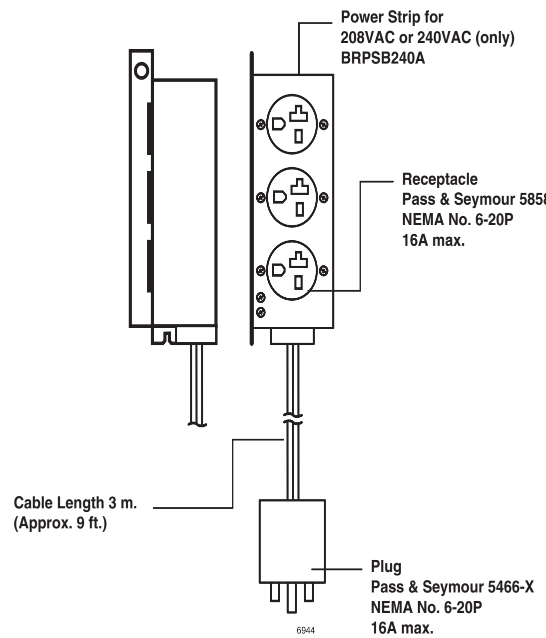
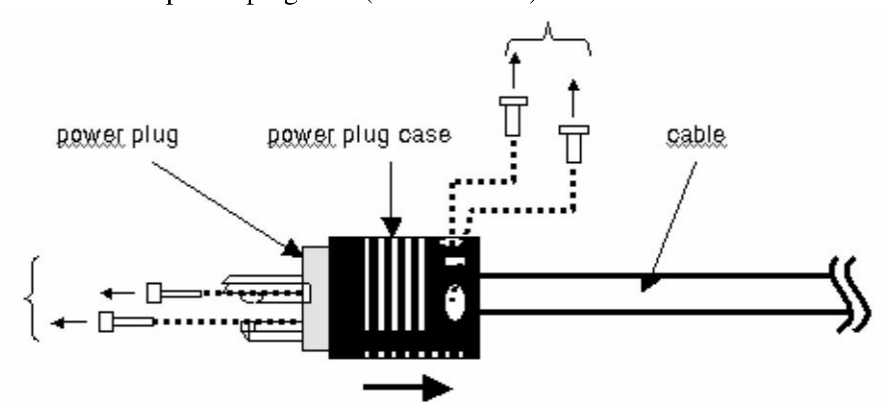


Figure 5-13 Power Strip (BRPSB240A)

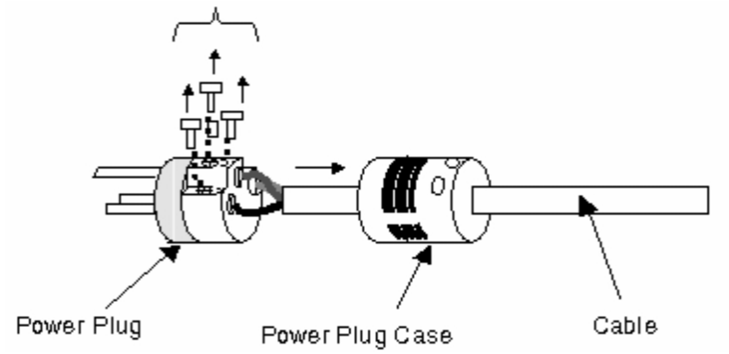
Step 1: Remove NEMA 6-20P from Power Strip

1. Unplug the power strip from the AC.
2. Loosen a screw on both the power plug case and power plug.
3. Slide out the power plug case (shown below).



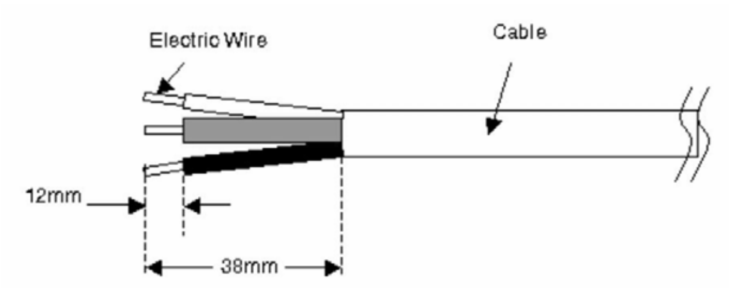
4. Loosen a screw on the power plug for cable.

5. Pull out cable from the power plug (shown below).

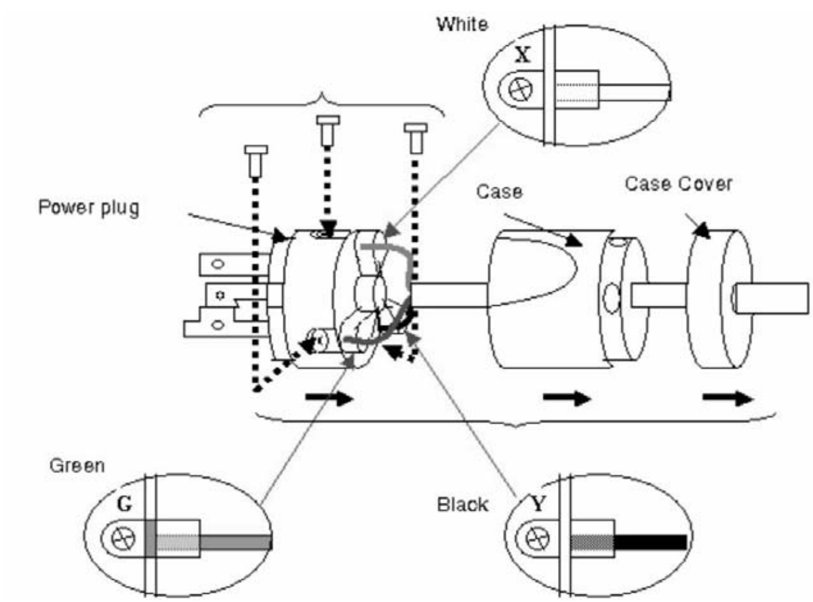


Step 2: Attach NEMA L6-20P Plug to Power Strip

1. Strip 1.49 inches (38mm) of cover off the electrical wire.
2. At the wire tip, strip approx. .47 inches (12mm) from the outer cover of the wire (shown below).

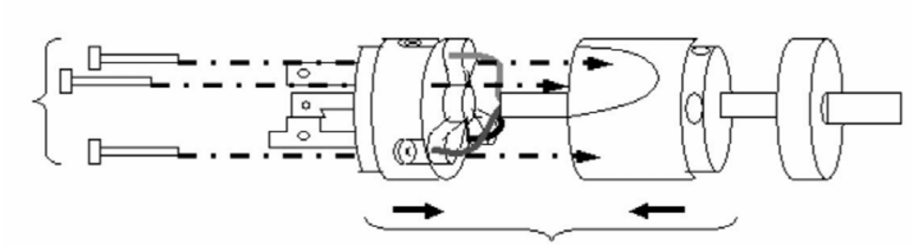


3. Each of the three electrical wires are inserted in a power plug and a screw tightened. The torque of a screw is 0.8[Nm]. The wires and power plug matches in the following manner (shown below):
   - G (FG) matches the green wire.
   - Y matches the black wire.
   - X matches the white wire.

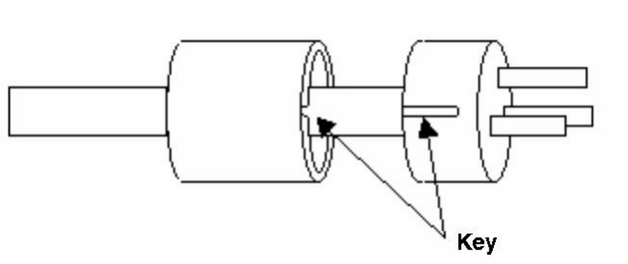


Rack Mount Cabinets

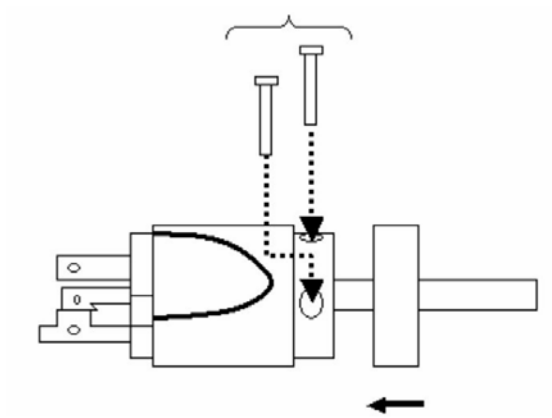
4. Put the power plug in a case and secure with a screw (shown below).



Note A key is arranged when a power plug and a case are fixed.

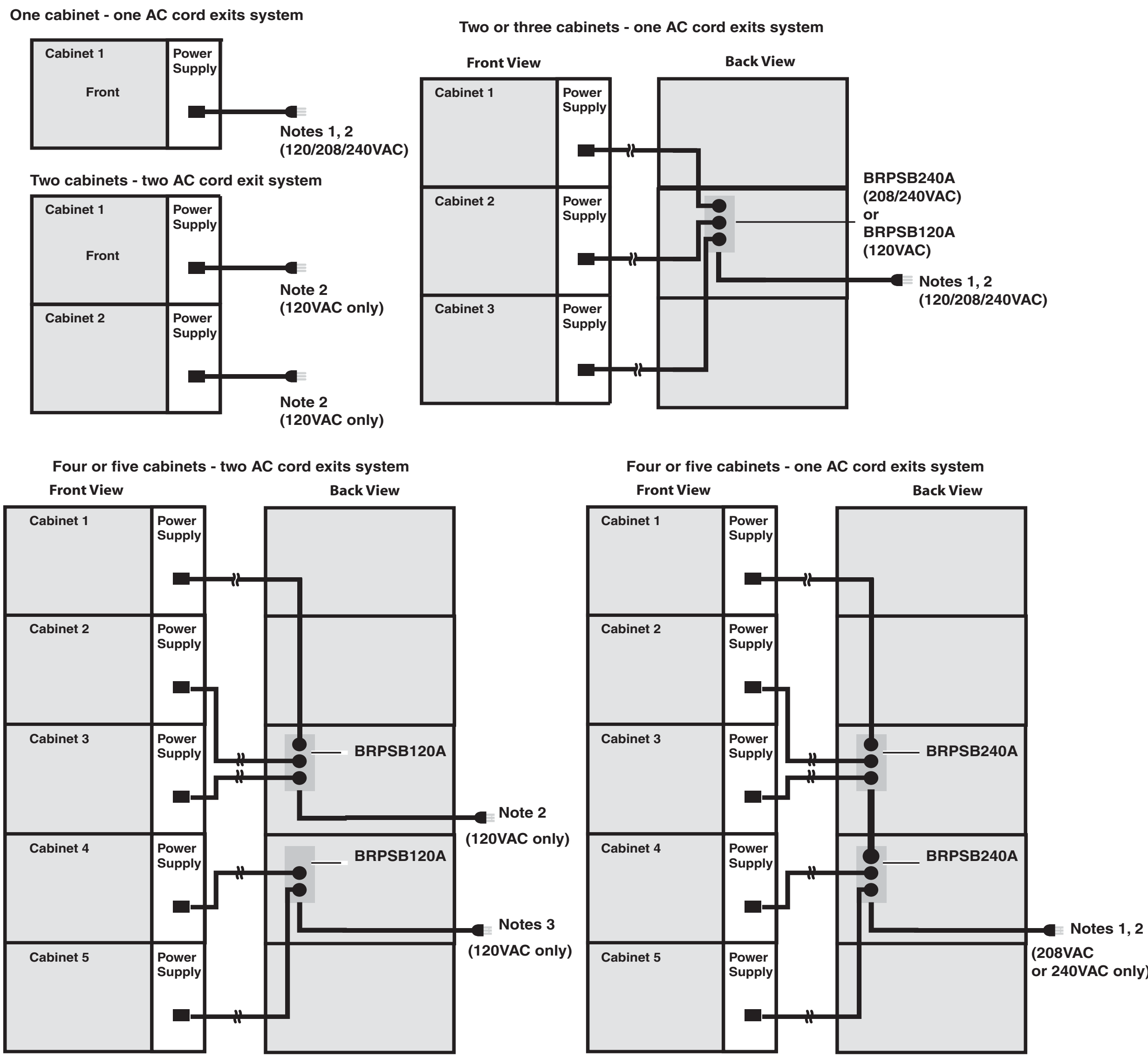


5. Tighten the screws (torque is 0.8[Nm]) and push cover and plug together (as shown below).



AC Cabling

Note 1, 2 or 3 power strips are used depending on how many cabinets are installed (see diagrams shown below.



Notes

1. 120VAC cord is supplied with cabinet. A special cord, BACL240A, must be ordered for each cabinet if 208VAC or 240VAC is used.
2. Power Strips must plug into the following AC outlets: 120VAC to NEMA 5-15R, and 208/240VAC to NEMA 6-20R.
3. If four cabinets are installed only one BRPSB120A is required. You can plug the fourth cabinet power supply directly into the 120VAC outlet.

Figure 5-14 AC Cabling (One to Five Cabinets)

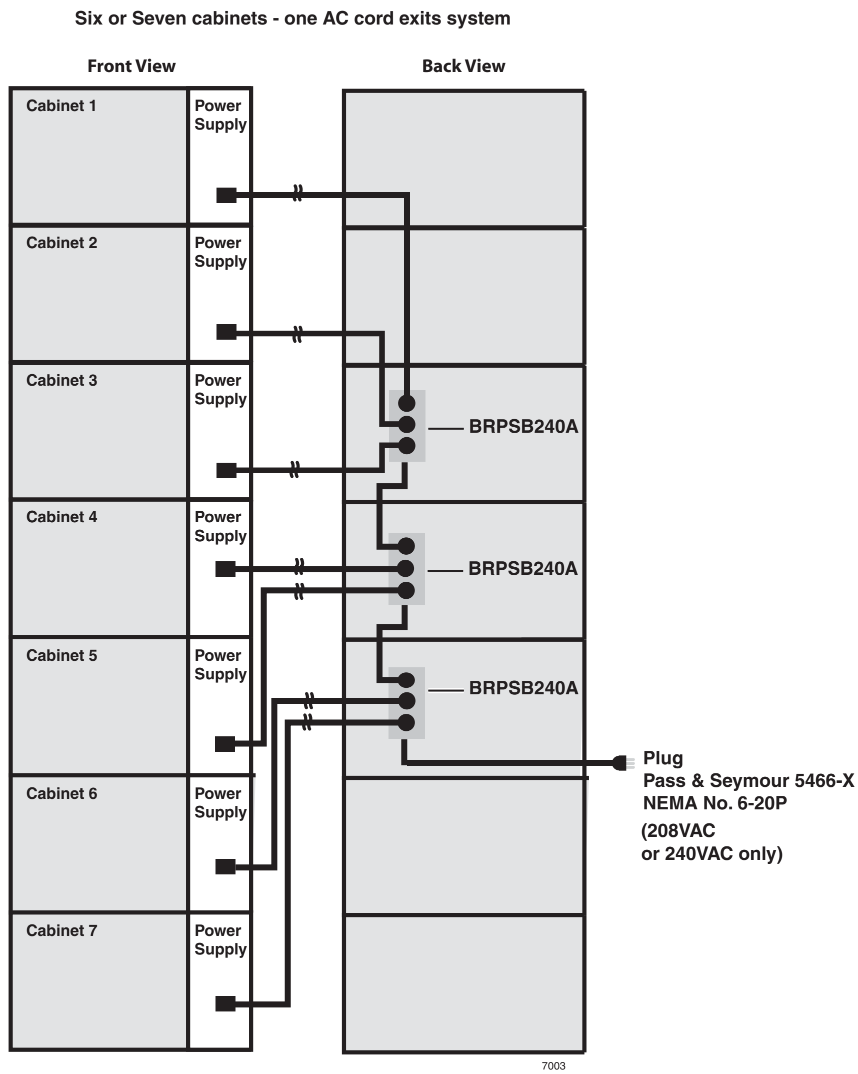


Figure 5-15 AC Cabling (Six to Seven Cabinets)

Remote Expansion Cabinet Unit

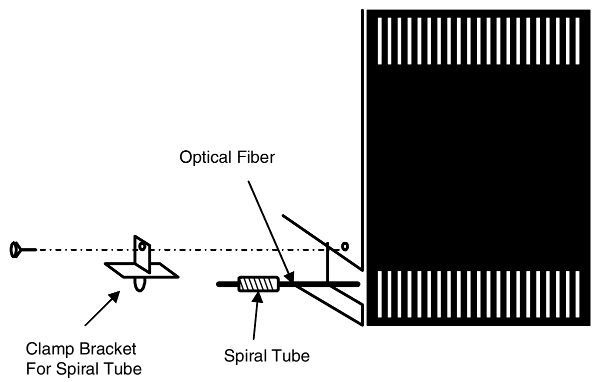
The RRCU1A PCB enables a Rack Mount Expansion Cabinet to be located up to three kilometers from its Base Cabinet. One RRCU1A connects to up to two ribbon-type Data Cables and applies the inter-cabinet signal to a fiber-optic pair. One fiber pair can support one or two expansion cabinets in one remote location using one RRCU1A in the Base Cabinet and another in the Remote Expansion Cabinet.

All instructions apply to both the Base Cabinet and the Remote Expansion Cabinet except where specifically noted.

Note See "Remote Expansion Cabinet Unit" on page 4-55 for additional information.

Remote Cabinet Installation Instructions

1. Install cabinets according to the instructions given at the beginning of this chapter. Pay particular attention to wiring and grounding instructions given for Remote Expansion Cabinets.
2. If installing a standalone Remote Expansion Cabinet, or the first in a stack, set the "BASE/ EXP" switch to "BASE" in accordance with Figure 5-12.
3. Cabinets in which RRCU cards are installed must be modified to protect the routing of the cables through the cabinet.
   - Attach the plastic guide to the bracket provided with the RRCU1A card (shown right).
   - Attach the bracket to the wall of the cabinet.

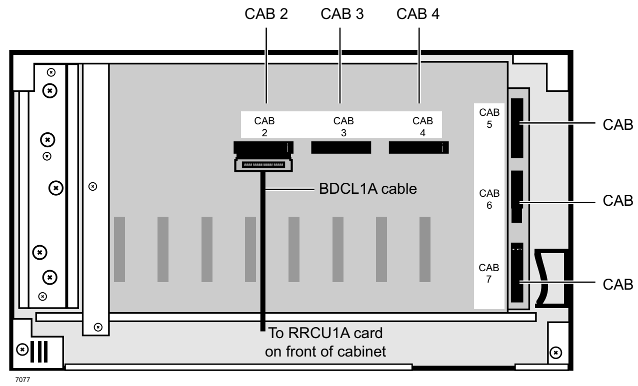


4. Install the RRCU Card (see Figure 4-36 on page 4-53 for a detailed description of RRCU)
   - Select correct jumper options. On the Master side, both option plugs connect the center pin to the upper pin (M1, M2). On the Slave side, both option plugs connect the center pin to the lower pin (S1, S2).
   - Remove the protective rubber cap from the fiber connector on the ROMS1A daughter board.

Important! *When installing the RRCU, be sure to put the card in the slot before attaching the data cables. Detach the data cable before removing an RRCU1A. Failure to do so may cause interference with other data highways.*

5. Insert the cards
   - On the Master side, the RRCU card may be installed in Slots 1~8.
   - On the Slave side, the RRCU card may be installed in Slots 1~10.
   - The RRCU1A is a non-timeslot card and can be installed in slots normally left vacant adjacent to digital trunk cards.

6. Connect the data cables
   - At the Base Cabinet, attach an BDCL1A data cable from the data cable connector on the back of the cabinet (shown right) to Connector M1 or M2 on the RRCU card. (Cables are provided according to the connectors on the RRCU card to which they are attached, see Table 5-6.)



   - The cabinet connected to M1 in the base emerges on connector S1 of the RRCU1A at the Remote Expansion Cabinet.
   - The cabinet connected to connector M2 of the RRCU in the base emerges on connector S2 of the RRCU1A at the Remote Expansion Cabinet.

Note Coil the excess tie it with a tie wrap. Be careful not to bind the cable tightly.

Table 5-6 Remote Cabinet Data Cables and Connectors

Data Cables	RRCU Connectors			
	M1	S1	M2	S2
BDCL1A-MS1	X	X		
BDCL1A-M2			X	
BDCL1A-S2				X

X=applies to connector

7. Connect the fiber optic cables
   - Attach fiber to the SC connectors on the ROMS1A daughterboard.
   - The TX side of the Master connects to the RX side of the slave.
   - The RX side of the Master connects to the TX side of the slave.
   - TAIS recommends that the cables be marked within the cabinet for ease of maintenance.
   - Observe the minimum bend radius of 30mm.
8. Restore power.

PCB Installation 6

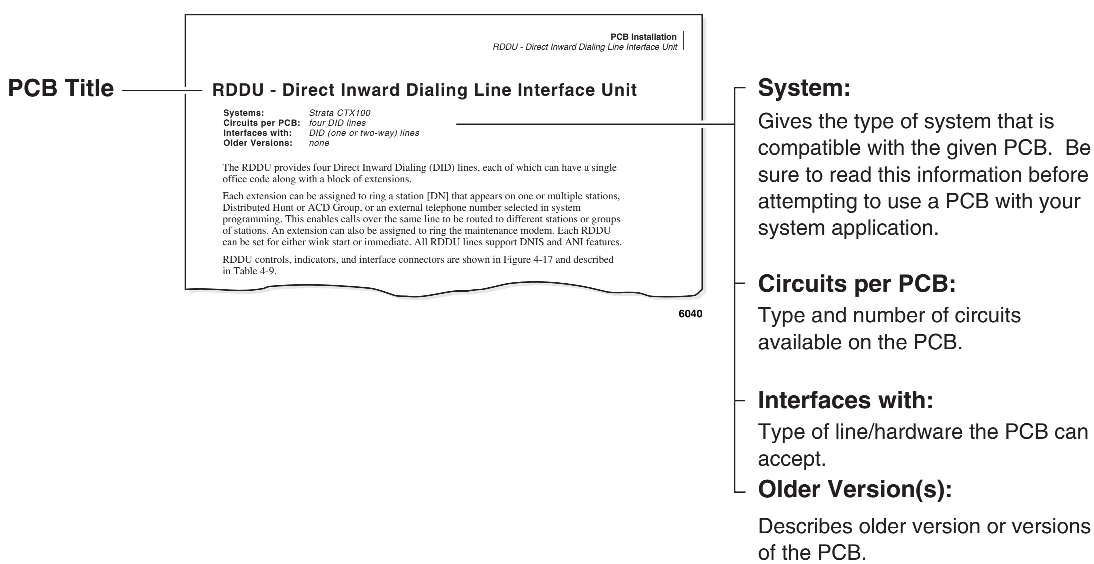
This chapter contains information on Printed Circuit Boards (PCBs) which can be used in the cabinet slots of the Strata CTX systems.

Note Prior to PCB installation, the power supply must be tested and the ground checked.

PCB Chapter Layout

Each PCB outline begins with the PCB's designation and title (the outline appears in the chapter in alphabetical order by designation). A brief synopsis of the PCB appears next and includes a notation of the system(s) that the PCB can be used in, the circuits supplied by the PCB, what equipment the PCB interfaces with, and a list of the PCB's older version(s) with a brief description of their differences.

Installation instructions follow the synopsis with a table showing the PCB's controls, indicators and connectors and an illustration of the board.



PCB Installation

PCB Hardware/Software Options

PCBs can be configured for a variety of hardware and software options.

- **Hardware Options** – Hardware options are defined as either internal (generally related to optional PCB subassemblies) or external (related to connection of peripheral equipment, such as background music, voice mail, etc.). Each PCB must be configured for the applicable hardware options prior to installation of the PCB.

  Configurations for internal hardware options are in this chapter and Chapter 10 – MDF PCB Wiring. Configurations for external hardware options appear in Chapter 12 – Peripheral Installation.

- **Software Options** – After installation of the PCBs in the KSU, configure the PCBs for software options through programming (see the *Strata CTX Programming Manual*).

CTX100 ACTU Processor PCBs

System: *Strata CTX100 Base Cabinet*
Current Version: *ACTU1A*
Older Version(s): *None*

For information about the CTX100 ACTU processor, see "CTX100-S and CTX100 Processors" on page 2-2 and "Set Jumpers and Install Option PCBs onto the ACTU" on page 3-19.

CTX670 BCTU/BEXU Processor PCBs

System: *Strata CTX670 Base Cabinet*
Current Version: *BECU1A/BBCU1A*
Older Version(s): *None*

For information about the BECU/BBCU CTX670 processor PCBs, see "CTX670 Processor PCBs" on page 2-5 and "BCTU1A/BEXU1A Installation" on page 4-44.

CTX670 BECU/BBCU Processor PCBs

System: *Strata CTX670 Base Cabinet*
Current Version: *BECU1A/BBCU1A*
Older Version(s): *None*

For information about the BECU/BBCU CTX670 processor PCBs, see "CTX670 Processor PCBs" on page 2-5 and "BECU/BBCU Installation" on page 4-50.

PCB Installation Power Supply Considerations

WARNING! **The power supply must be Off whenever removing or installing the processor PCBs (see Figure 3-17 on page 3-19 and Figure 4-3 on page 4-9).**

Toshiba recommends turning the power supply be Off whenever possible when removing or installing the other PCBs.

ADKU – Digital Telephone Interface Unit

Circuits per PCB: *eight digital telephone circuits*

Interfaces with: *all Toshiba digital telephones (corded and cordless, DDCB, DSS, ADM, BPCI)*

Older Version(s): *none*

ADKU Hardware Options

The ADKU digital telephone interface unit only works with the CTX100. Refer to Chapter 11 – Station Apparatus for instructions on how to connect digital telephones, DDCBs, and DDSS consoles to the ADKU, as well as how to upgrade digital telephones with these options: a PC Interface Unit (BPCI), a Speaker Off-hook Call Announce upgrade (BVSU), and a Headset/ External Speaker (BHEU).

ADKU Installation

➤ Insert the ADKU (component side facing right) into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors.

ASTU – Standard Telephone Interface Unit (CTX100 only)

Circuits per PCB:	*two standard telephone circuits* *maximum number of ringers per circuit is three*
Interfaces with:	*standard telephones (no message waiting)* *other single-line devices* *alternate BGM source* *FAX machine* *voice mail devices*
Older Version(s):	*none*

The ASTU works with the CTX100 Base system with R1.3 and higher software. It provides two standard telephone ports and connects to a unique slot on the side of the CTX100. It does not occupy one of the universal slots.

ASTU Installation

1. Turn the power to the CTX100 off (press the DC power switch) and unplug the system.
2. Remove the front and left-side covers from the CTX100.
3. Refer to Figure 6-1 and Table 6-2. Make sure the SW2 switch is in the “Mu law” position for the U.S. and Canada.
4. Align the holes on the ASTU with the white plastic posts on the left side of the CTX100 Base Cabinet. Firmly press the ASTU onto the posts to attach it to the CTX100. Make sure that you can still reach all attached cables and wires.
5. Slip the spade of the FG1 (green wire) under the grounding screw on the CTX100 and tighten the screw.
6. From the CTX100, locate the multi-colored five wire cable (white connector) and plug it into the P1 connector on the ASTU.
7. On the ASTU, locate the 10-wire P2 connector cable and plug it into the front of the ACTU processor PCB on the CTX100 (see Figure 6-2). Press firmly so that both black flip-locks snap shut. (To remove, flip up the front and back locks.)
8. Connect the standard telephone(s) or devices to J1 and J2 on the ASTU.
9. Plug in the CTX100 power and turn on the DC power switch in the front of the CTX100. If everything seems to be working, re-attach the outside covers.
10. Power down and power up the CTX100 and the system will automatically recognize the ASTU in virtual slot 09. Otherwise, you can use CTX WinAdmin R1.3 or later to assign the ASTU in the 0109 position.

ASTU1 Wiring

1. 300 ohms loop resistance max., including the telephone or other devices DC off-hook resistance.
2. ASTU requires secondary protectors with standard voltage for outside wiring. See Table 6-1 for electrical characteristics.

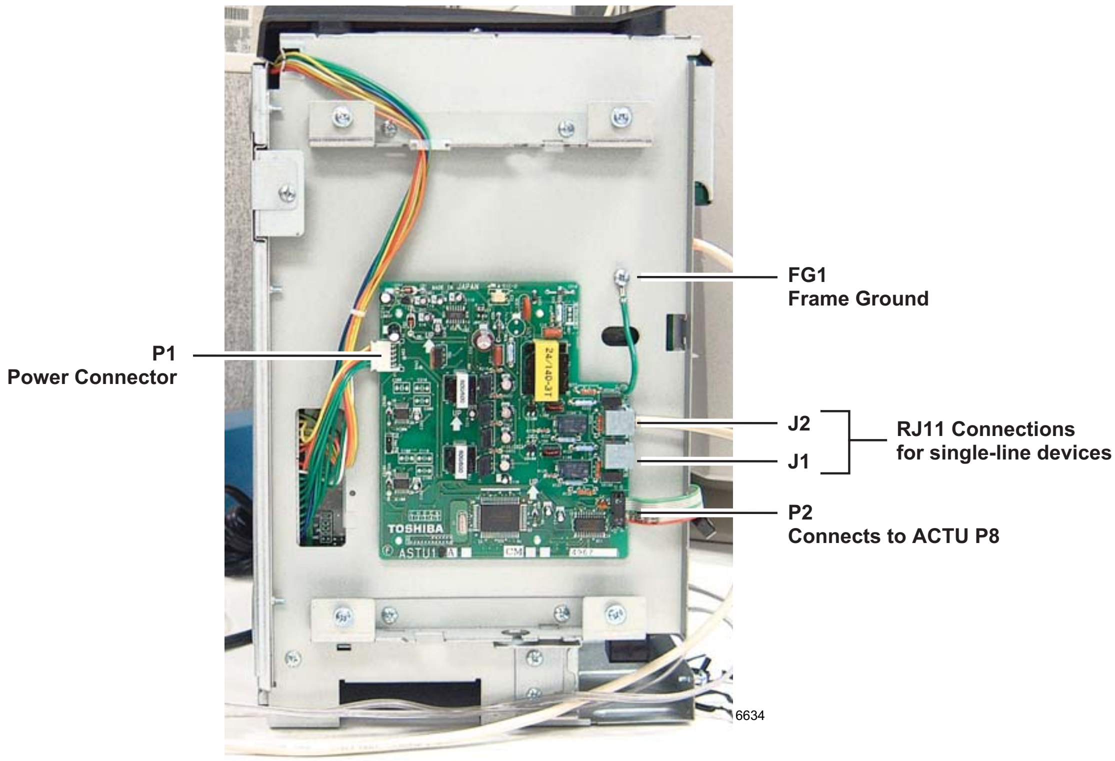


Figure 6-1 ASTU Controls and Interface Connectors

Table 6-1 ASTU Controls, Indicators, and Interface Connectors

Control/Indicator/Connector	Type of Component	Description
P1	5-wire connector cable	Connects to the motherboard for supply power.
P2	10-wire connector cable	Connects to the processor PCB for data and signal highway.
J1, J2	RJ11 - 6-pin modular	Interfaces with single-line devices.
SW2	Jumper plug	Factory shipped in “Mu law” position. For countries requiring “A Law,” switch to “A.”
FG1	Green Wire	Connects to the chassis with a screw (frame ground).

Table 6-2 ASTU Electrical Characteristics

Item	Description
Single line device interface	RJ11 Connector
Ringer Type	Square Wave
Ringer Voltage	190Vp-p Open Voltage (Square Wave)
Line Voltage	-24V

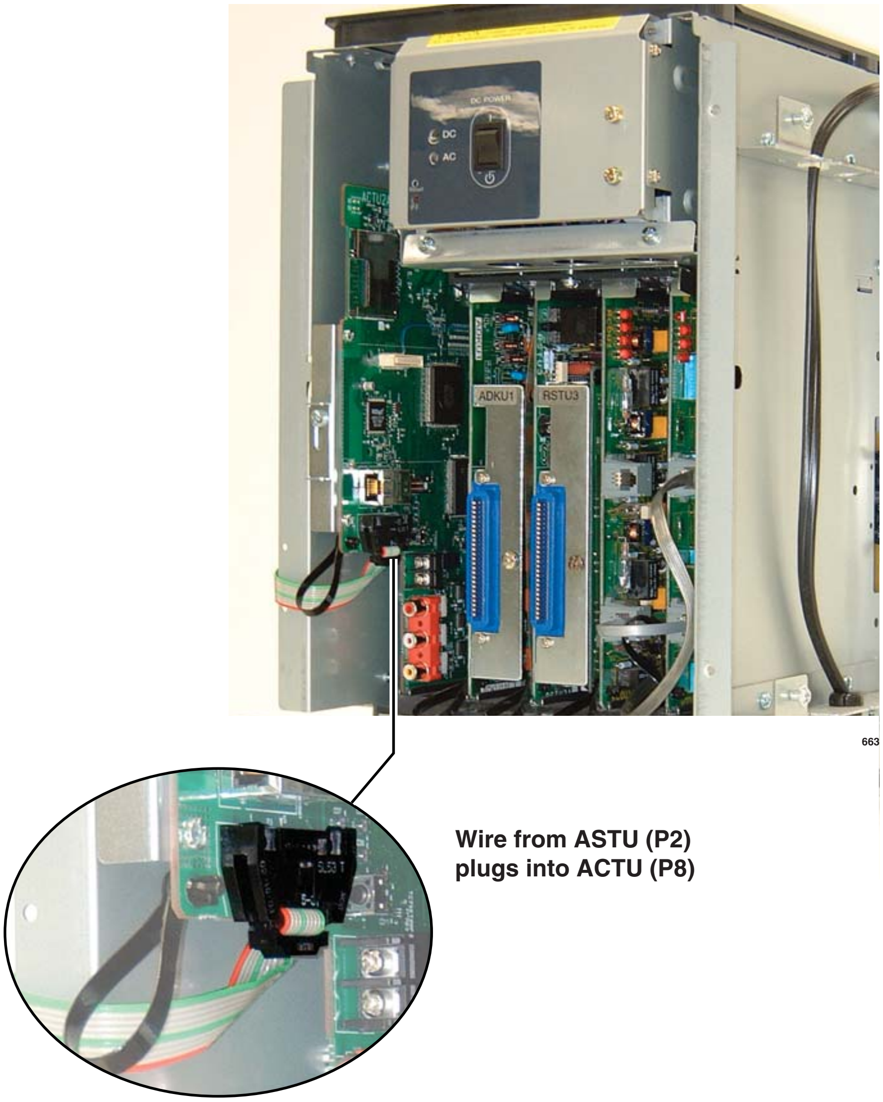


Figure 6-2 ASTU/ACTU Wire Connection

BDKU/BDKS – Digital Telephone Interface Unit

Circuits per PCB: *eight digital telephone circuits (plus eight more with the BDKS PCB)*
Interfaces with: *all Toshiba digital telephones (corded and cordless, DDCB, DSS, ADM, BPCI)*
Older Version(s): *none*

BDKU Hardware Options

BDKU can be equipped with a BDKS piggyback PCB to provide a total of 16 circuits. Refer to Chapter 11 – Station Apparatus for instructions on how to connect digital telephones, DDCBs, and DDSS consoles to the BDKU/BDKS, as well as how to upgrade digital telephones with these options: a PC Interface Unit (BPCI), a Speaker Off-hook Call Announce upgrade (BVSU), and a Headset/External Speaker (BHEU). The BDKU can be installed alone, or with the BDKS subassembly.

BDKS

The BDKS can be installed onto the BDKU to add eight more digital telephone circuits.

➤ **To install the BDKS**

➤ Match the BDKS connectors to the BDKU, as shown in Figure 6-4. Press firmly to ensure that the connectors are snug.

BDKU Installation

1. Set the BDKU/PDKU switch for the appropriate system (refer to Figure 6-4 and Table 6-3).
2. Insert the BDKU2 (component side facing right) into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors. Refer to “Worksheet 6: Strata CTX670 Cabinet Slots” on page 2-37 to ensure the BDKU is in a suitable slot.
3. Install the Ferrite Core (comes with the BDKU) onto the 25-pair cable that connects the BDKU to the MDF: Flip open the two snaps on the Ferrite Core, then snap it shut around the BDKU cord as shown in Figure 6-3. The core must be as close as possible to the BDKU.

   The core is needed to comply with FCC requirements.
4. Some Ferrite Cores require a tie-wrap at the bottom to keep it from sliding. For those, feed the tie-wrap through the slots in the Ferrite Core, then cinch it.

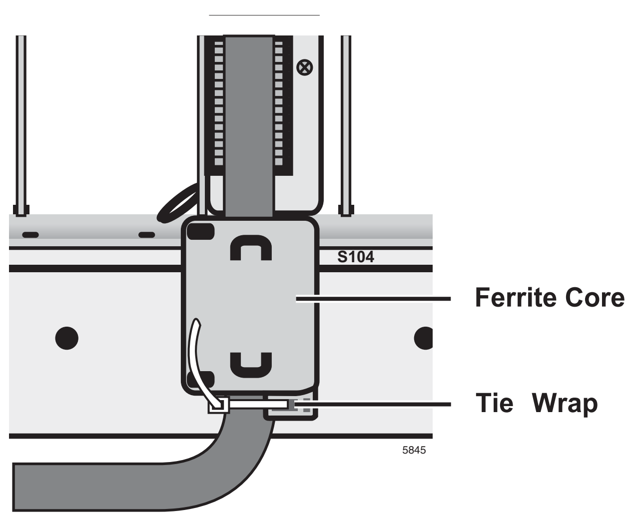


Figure 6-3 BDKU Ferrite Core

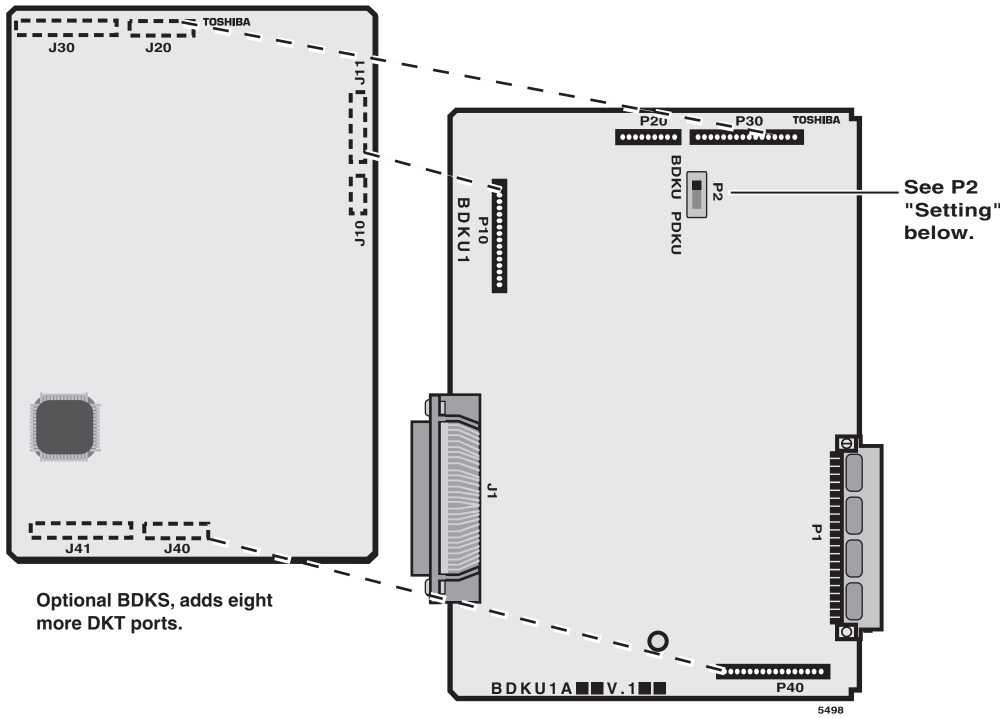


Figure 6-4 BDKU/BDKS PCB

Table 6-3 BDKU Controls, Indicators, and Interface Connectors

Control/Indicator/Connector	Type of Component	Description
P2	BDKU/PDKU Jumper Plug	Strata CTX: set P2 to BDKU for all slots to enable: 3000-series telephone features and buttons and the BDKS to be operational.
		Strata DK: set P2 to PDKU for all slots: All DK Cabinet slots (BDKS does not function on the Strata DK) If the switch is set to the PDKU mode, the DKT3000-series telephone LCD will be 16 characters, and the Spdial and LCD Feature buttons will not work.

BIOU – Option Interface Units

Circuits per PCB: *(see interfaces)*
Interfaces with: *three music-on-hold sources, system page and control relays*
Older Version(s): *none*

The BIOU provides a Paging Output (amplified and non-amplified), four zone paging relays, three Music-on-hold (MOH) interfaces and four control relays (Night Transfer, Night Bell and Background Music (BGM) mute). One or two BIOUS can be installed in a Strata CTX.

BIOU controls, indicators, and interface connectors are shown in Figure 6-5 and described in Table 6-4.

BIOU Installation

➤ Insert the BIOU (component side facing right) into any available PCB slot in the cabinet. See “Worksheet 6: Strata CTX670 Cabinet Slots” on page 2-37. Apply firm, even pressure to ensure proper mating of connectors.

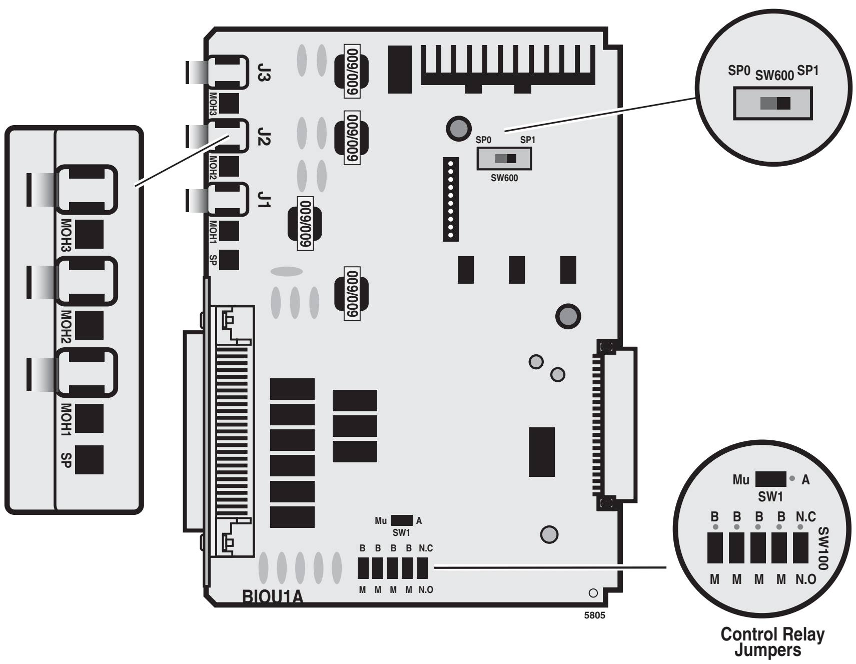


Figure 6-5 BIOU PCB

Table 6-4 BIOU Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
SW600	Page Output Switch	SP0=600 ohms. SP1 = 3-watt amp.
J1, J2, J3	RCA jack for connecting MOH/BGM source	Interface connector for MOH/BGM source 1, 2, or 3.
MOH1, MOH2, MOH3	Screwdriver volume control	Adjusts volume of respective MOH jacks 1, 2, and 3.
SP	Screwdriver volume control	Adjusts volume of SP1; 3-watt page amplifier.
B/M	Break/Make control relay jumpers	Set in the Make (close) or Break (open) position, depending upon which one should occur when the application relay activates.
N.C/N.O	Jumper plug	Not used.
SW1 Mu/A	Jumper plug	Select Mu law for U.S. and Canada.

BSTU/RSTU – Standard Telephone Interface Unit

Circuits per PCB: *eight standard telephone circuits*

Interfaces with: *standard telephones*
voice mail ports
off-premises stations
other similar devices
alternate BGM sources
auto attendant digital announcer
message waiting lamp

Older Version(s): *RSTU3, RSTU2, RSTU1*

The BSTU and RSTU are basically the same and are interchangeable. Ringer Capacity for the BSTU is three telephones or devices per circuit. RSTU1, 2 and 3 allow one telephone or device per circuit.

Notes

- For the system to recognize the DTMF tones generated by a standard telephone (or any other device connected to a standard telephone port), a DTMF receiver unit must be equipped on the processor PCB (ARCS subassembly must be installed on ACTU processor of the CTX100. DTMF receivers are standard on CTX670 processors).
- BSTU and RSTU3 provides Message Waiting (MW). RSTU1 and RSTU2 do not provide MW.

R48S -48 Volt Supply Subassembly Installation

R48S is required for line loop resistance greater than 600 ohms. The maximum loop resistance allowed with 48S = 1200 ohms; without 48S = 600 ohms.

➤ Mate the R48S connectors P6 and P7 (Figures 6-6~6-9) with the R48S connectors P6 and P7 on the BSTU or RSTU.

Note BSTU and RSTU connectors P6 and P7 are positioned so that the R48S only fits in the proper position.

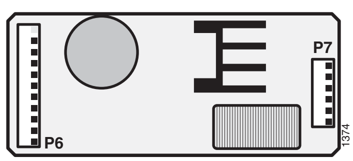


Figure 6-6 R48S Interface Connectors

BSTU/RSTU Installation

1. Make sure the factory-installed SBSS (BSTU subunit) or SRSS (RSTU subunit) is securely attached to the BSTU or RSTU (Figures 6-8 and 6-9).

WARNING! The shield on the back of the BSTU and RSTU is designed to protect you from potentially hazardous ring voltage. Do NOT remove this shield.

Note "RSTU" can be substituted for "BSTU" in these instructions.

2. Insert the BSTU (component side facing right) into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors.

3. After installing the BSTU, gently pull the BSTU outward. If the connectors are properly mated, a light resistance is felt.

Note When installing the RSTU3 into an existing system, system power must be cycled only if the MW mode (P11) is changed.

Table 6-5 BSTU Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
R48S connector P6	9-pin connector	Interface connector to P6 of R48S.
R48S connector P7	6-pin connector	Interface connector to P7 of R48S.
Mu/A P10	3-terminal jumper	Mu Law or A Law PCM companding. (Must be set to Mu Law in the U.S. and Canada). No strap = Mu Law.
Ring-time P12	3-terminal jumper	Always set jumper to “REN3.”

Table 6-6 RSTU1, 2 and 3 Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
R48S connector P6 (RSTU)	9-pin connector	Interface connector to P6 of R48S.
R48S connector P7 (RSTU)	6-pin connector	Interface connector to P7 of R48S.
Mu/A P10 (RSTU3 only)	3-terminal jumper	Mu Law or A Law PCM companding. (Must be set to Mu Law in the U.S. and Canada). No strap = Mu Law.
MW (Message Waiting) Mode P11 (RSTU3 only)	3-terminal jumper	CON = Electronically controlled message waiting light (U.S. and Canada). NOR = Relay controlled message waiting light. Do not use this in the U.S. and Canada since this option may cause message waiting cross-talk noise in some installations.

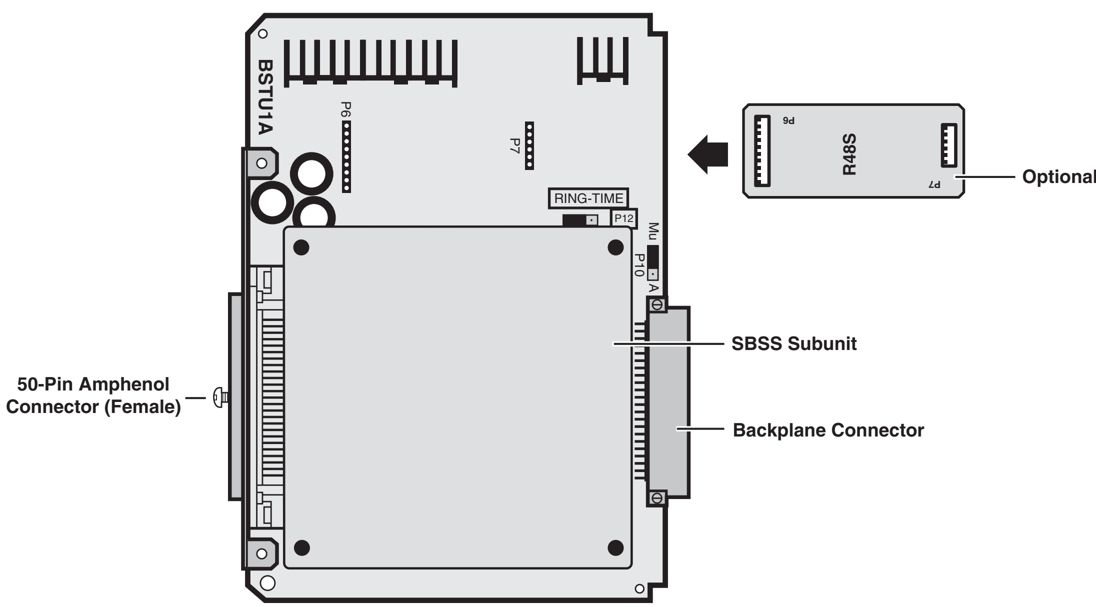


Figure 6-7 BSTU Controls and Interface Connectors

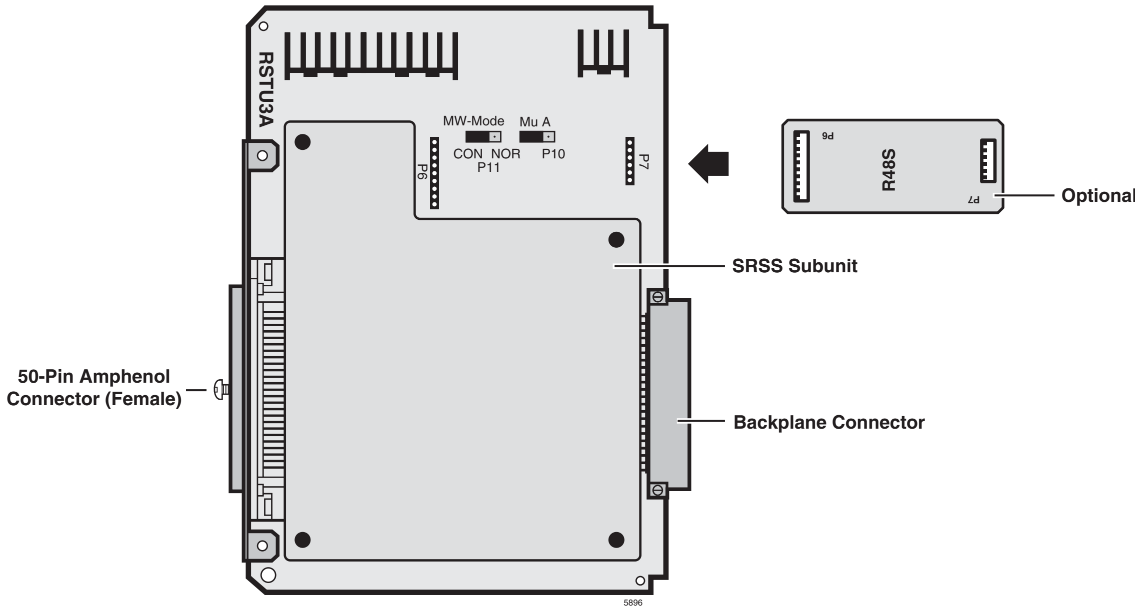


Figure 6-8 RSTU3 Controls and Interface Connectors

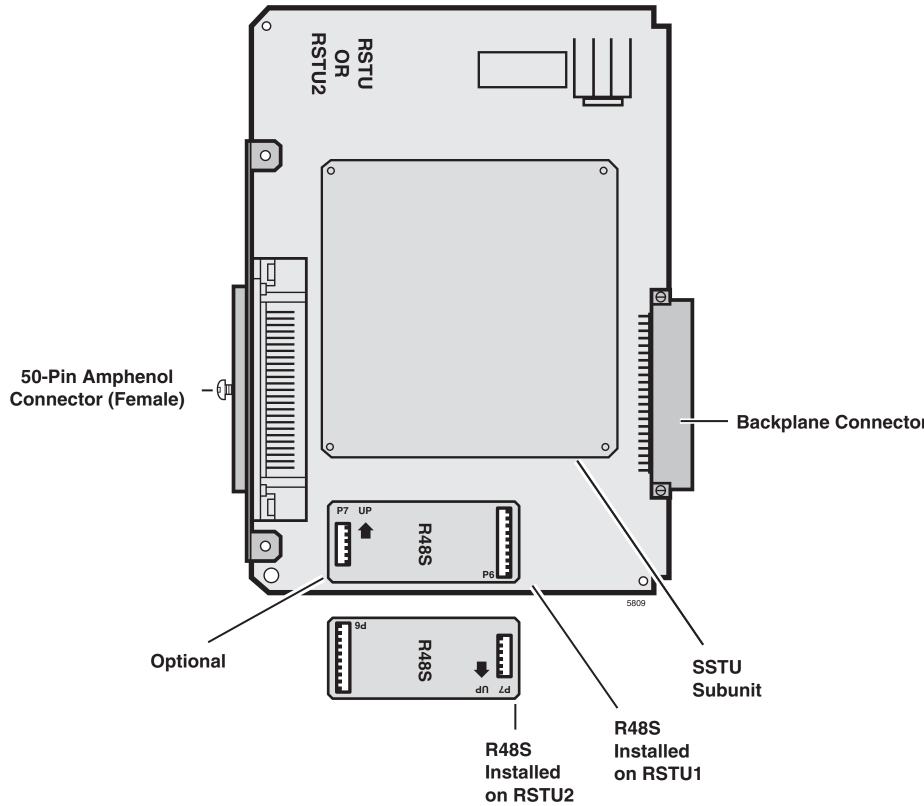


Figure 6-9 RSTU or RSTU2 Controls and Interface Connectors

BVPU – Internet Protocol (IP) Interface Unit

Circuits per PCB: *four Tie line circuits; one 10BaseT Ethernet connection*

Interfaces with: *H.323 version 2 terminals over an IP network*

Appears as: *4 E&M Tie lines*
2- or 4-wire transmission
Type I and II Signaling
Immediate and Wink Start

Older Version(s): *none*

BVPU Configuration

Note Maximum of five BVPUs for CTX670 and a maximum of two BVPUs for CTX100 because of FCC Part 15 Electromagnetic Capability (EMC) emissions restrictions.

BVPU controls, indicators, and interface connectors are shown in Figure 6-10 and described in Table 6-7.

BVPU Installation

1. Insert the BVPU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors.
2. Attach the 10BaseT Ethernet connection to the LAN connector.
3. Connect a PC equipped with Maintenance Console Software (MCS) to the serial port according to the drawing below. A serial connection is necessary to establish the IP address of the BVPU. Once the IP address is established, maintenance may be conducted over the Ethernet port.
4. After installing the BVPU, gently pull it outward. If the connectors are properly mated, a slight resistance is felt.

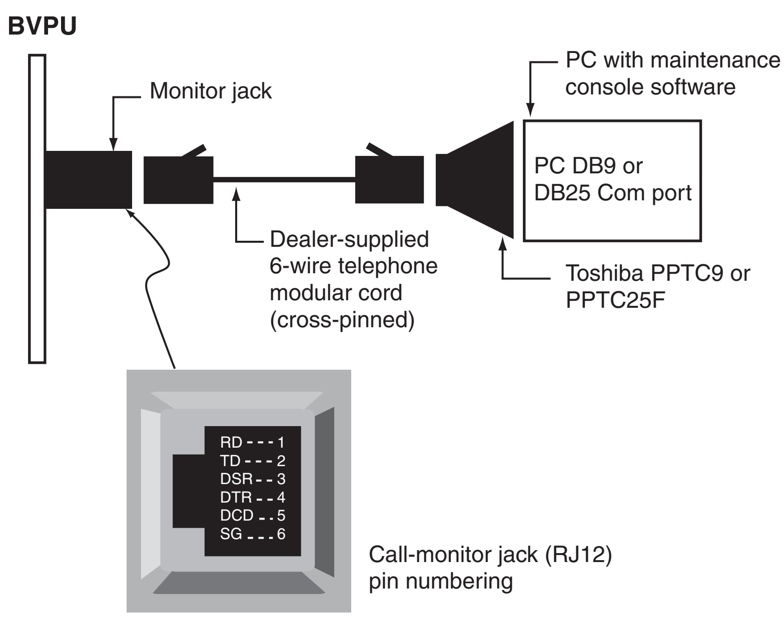


Figure 6-10 BVPU Monitor Jack

Table 6-7 BVPU Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
Serial Port		RS-232C maintenance connection
LAN Connector	RJ45	10BaseT ethernet connection
SW0	DIP Switch	Unused. All switches = Off
LED 1	Green LED	On = Tie trunk 4 active
LED 2	Green LED	On = Tie trunk 3 active
LED 3	Green LED	On = Tie trunk 2 active
LED 4	Green LED	On = Tie trunk 1 active
LED 5	Green LED	Power On/Off
LED 6	Yellow LED	Line Status (On=Busy / Off = Idle)
LED 7	Red LED	Alarm (On = Abnormal)
LED 8	Green LED	On-Line
		On = Operating
		Off = Starting up or Off
		Slow Flash = Detected error in BVPU
		Fast Flash = Shut down mode
LED 9	Yellow LED	Link Indication (On = Normal)
LED 10	Green LED	Data (On = Data communication in progress)
LED 11	Yellow LED	Collision (On = collisions occurring)

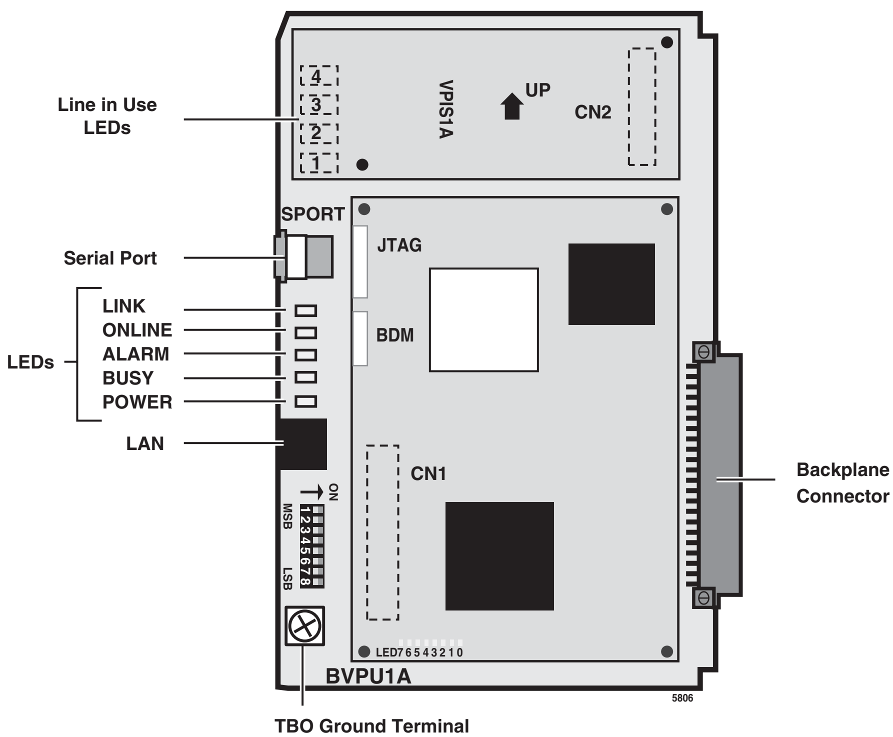


Figure 6-11 BVPU PCB

BWDKU1A – Digital Telephone Interface Unit

Circuits per PCB: *16 digital telephone circuits*

Interfaces with: *all Toshiba digital telephones (corded and cordless, DDCB, DSS, ADM, BPCI)*

CAUTION! **Existing SpectraLink interface units are not compatible with the BWDKU1A. A firmware update will be available from Spectralink in the near future.**

When installing Add-on modules, be sure to check Table 10-1 on page 10-2 to verify maximum line lengths. BWDKU supports 1 pair wiring per Table 10-2 on page 10-6.

Older Version(s): *none*

The BWDKU1A is very similar to the BDKU + BDKS, but it supports 16 DKT circuits with a single PCB. It is also compatible with Strata DK but only supports eight circuits.

BWDKU1A Installation

1. See Table 6-8 and Figure 6-12, then make any jumper adjustments needed for DKT or slot requirements. The BWDKU1A can be installed in any slot; however, if it is installed in expansion slots S_07~S_10, you must move the jumper plug to the “8 CCT” position.

Important! *Do not detach the SWDR1A subassembly. The BWDKU1A will not work properly without it.*

2. Insert the BWDKU1A (component side facing right) into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors.

Table 6-8 BWDKU1A Slot Placement

Slot Numbers	Available Circuits	BWDKU1A Jumper Settings
Base & Expansion S_0 ~S_06	16	The CTX identifies the BWDKU1A as a BDKU + BDKS. Leave jumper plug 503 in the “BDKU” position and leave P504 in the “16 CCT” position.
Expansion S_07~S_10	8	Move jumper 504 to the “8 CCT” position when the BWDKU1A is placed in slots S_07~S_10. The BWDKU1A will work like a BDKU on a CTX system. **Note** If the BWDKU1A is installed on DK system, move jumper P503 to the “PDKU” position.

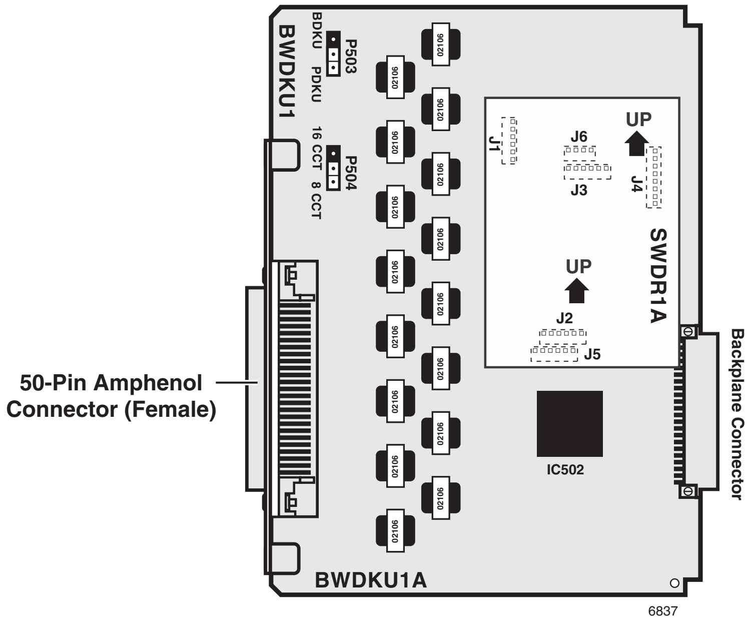


Figure 6-12 BWDKU1A PCB

Note The BWDKU1A does not need a Ferrite Core.

A comparison of the BWDKU1A and the BDKU/BDKS is shown in Table 6-9.

Table 6-9 BWDKU1A and BDKU/BDKS Comparison

BWDKU1A	BDKU/BDKS
DKT wiring is all 1 pair. Line length is shorter than the BDKU.	DKT wiring is 2 pairs (BDKU) and 1 pair (BDKS) mixed.
One protector circuit for every two circuits.	One protector circuit for every one circuit.

The power factor for the BWDKU1A is +5VDC = 0.8, -24VDC = 0.3.

Refer to Chapter 11 – Station Apparatus for instructions on how to connect digital telephones, DADMs and DDSS consoles to the BWDKU1A. Refer to Chapter 12 – Peripheral Installation for instructions on connecting Door Phones (DDCBs).

Programming

In Strata CTX Program 100, use the same CTX WinAdmin selections as the BDKU or BDKU/BDKS. A “BWDKU” selection will be added to Program 100 in a future version of CTX WinAdmin.

In Strata DK, Program 03, code selection 61, 62, or 64 for the “BWDKU.”

PDKU2 – Digital Telephone Interface Unit

Circuits per PCB: *eight digital telephone circuits*

Interfaces with: *digital telephones (with or w/o ADM) (See Notes under Hardware Options)DDSS console (circuit 8 only)*
cordless digital telephones (DKT2004-CT, DKT2104-CT)
DKT2001 single line digital telephones

Older Version(s): *PDKU1 (identical to PDKU2 except it does not support continuous DTMF tones w/DKT2000-series telephones, DIUs can only be connected to circuits 1~7)*

PDKU2 Hardware Options

PDKU2 does not have to be configured for any option. Refer to Chapter 11 – Station Apparatus for instructions on how to connect digital telephones, DADMs, and DDSS consoles to the PDKU2. Refer to Chapter 12 – Peripheral Installation for instructions on connecting Door Phones (DDCBs).

Notes

- BPCI, RPCI-DI and PDIU-DI are *not* supported on Strata CTX.
- With the DKT3000-series telephones, limitations are 16 (not 24) character LCD display, `Spdial` and LCD `Feature` buttons don't work and the BPCI cannot be used

There are no controls or indicators on the PDKU (Figure 6-13).

PDKU2 Installation

1. Insert the PDKU2 (component side facing right) into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors.
2. After installing the PDKU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

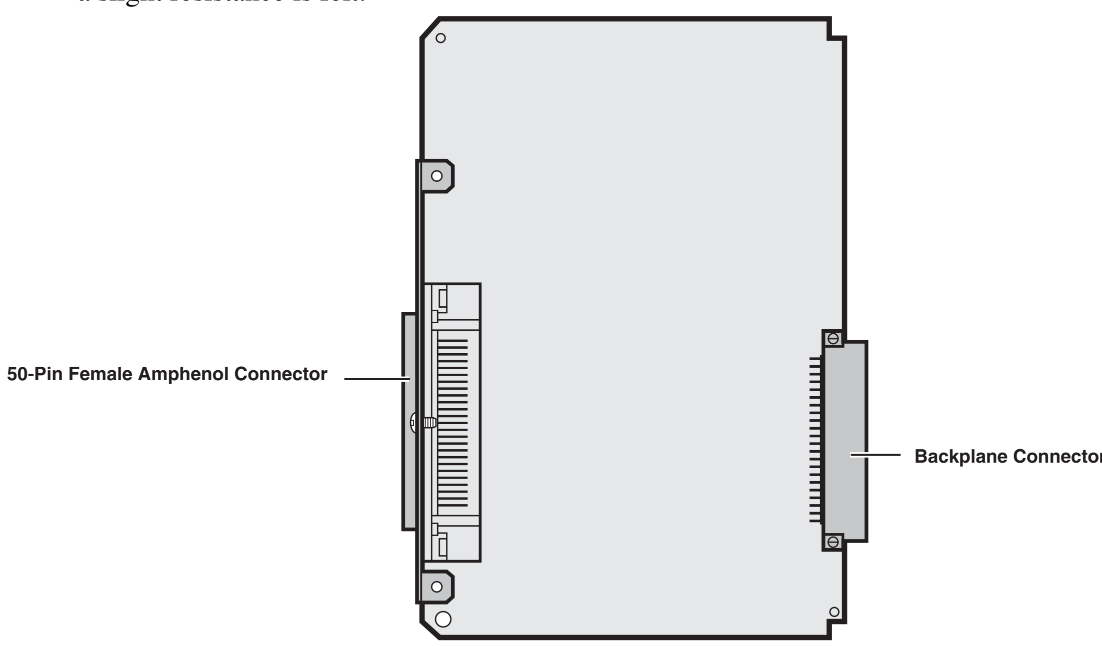


Figure 6-13 PDKU2 PCB

RCIU1, RCIU2, RCIS – Caller ID Interface

Circuits per PCB: *four Caller ID circuits*
Interfaces with: *loop or ground start lines w/Caller ID (requires RCOU or RGLU2)*
Older Version(s): *none*

The RCIU1, RCIU2 PCB provides the Caller ID feature, also known as Calling Number Delivery (CND).

Caller ID can be provided on analog loop start lines (PCOU or RCOU PCBs) and analog ground start lines (RGLU2 PCB) only. It is not available on any other type of analog lines (RDDU/DID and/or REMU, PEMU Tie) or any type of digital lines (RDTU- T1, including ground start, loop start, DID and Tie lines).

➤ An RCIU1/RCIS or RCIU2/RCIS circuit must be available in addition to each RCOU, RGLU, etc., line that is to receive Caller ID. When ordered from the factory, the RCIU1, RCIU2 PCB comes equipped with four Caller ID circuits.

RCIS PCB

An RCIS piggy-back PCB can be installed onto the RCIU to provide an additional four Caller ID circuits. Hence, an installed RCIU/RCIS can provide a maximum of eight Caller ID circuits per cabinet slot.

To provide up to eight circuits, always install RCIS onto RCIU1 or RCIU2 instead of installing two RCIU PCBs (Program 100 code 009 always assigns each RCIU slot with eight software Caller ID circuits).

Each RCIU/RCIS Caller ID circuit has a two-wire tip/ring interface which must be bridge-wired across its corresponding ground or loop start CO line tip/ring on the MDF (see Figure 10-11 on page 10-20). Each RCIU/RCIS modular jack provides interface for two Caller ID circuits.

RCIU1 or RCIU2 Installation

➤ Install the RCIU1/RCIU2 PCBs in any universal cabinet slot of the Strata CTX670 (except slot 11 or slot 12 if the RSIU is installed in slot 11).

Note It is not necessary to install the RCIU1, RCIU2, RCIU1/RCIS, or RCIU2/RCIS PCBs in the same cabinet as their associated CO lines or in slots adjacent to the lines.

RCIU1/RCIS or RCIU2/RCIS Installation

1. Install the RCIS onto the RCIU1 or RCIU2 as required (see Figures 6-14 and 6-15).
2. Install the RCIU1/RCIS or RCIU2/RCIS into the appropriate cabinet slot. The circuit modular jack numbering and the tip/ring cross connect wiring of BECU to RCOU, PCOU, or RGLU is shown in Figure 10-8 on page 10-13.

Note It is not necessary to install the RCIU1, RCIU2, RCIU1/RCIS, or RCIU2/RCIS PCBs in the same cabinet as their associated CO lines or in slots adjacent to the lines.

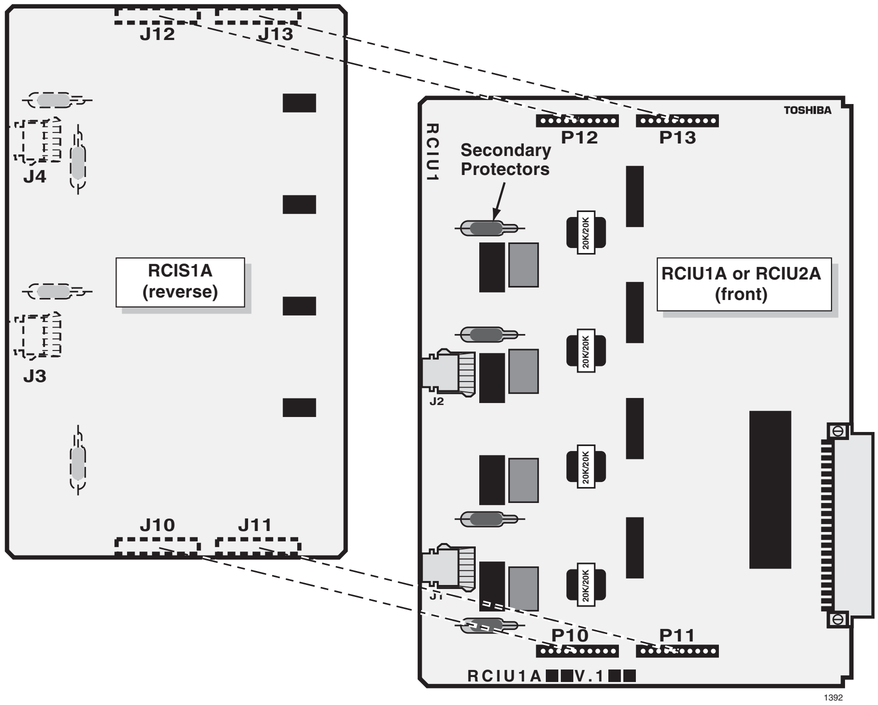


Figure 6-14 RCIU1/RCIS PCB

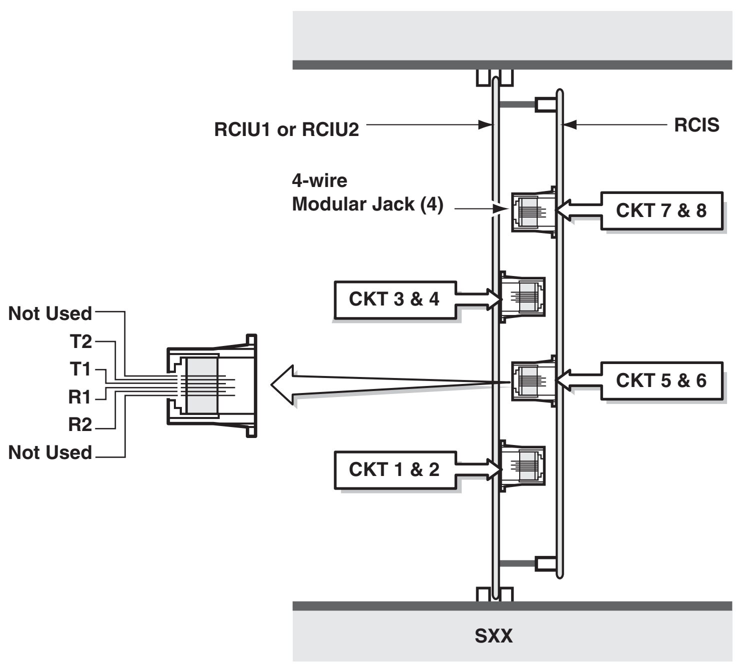


Figure 6-15 RCIU1/RCIS or RCIU2/RCIS PCB Modular Jack Positions

RCOU3A, RCOS3A – Four-Circuit Loop Start CO Line Interface Unit

Circuits per PCB: *four loop start CO line circuits*

Interfaces with: *loop start lines*

Older Version(s): *RCOU1 (does not have Mu Law/A Law jumper plug)*
PCOU2 (does not have ABR circuitry, uses RCTU, K4RCU ABR circuits)
PCOU1 (has ABR circuitry, identical and interchangeable w/PCOU2)

The RCOU3A and RCOU provide ring detection, dial outpulsing, and hold circuitry. Each RCOU line can be programmed for DTMF or dial pulse signaling and has surge absorbers for secondary protection.

The RCOU3A and RCOU PCBs are shown in Figures 6-18 and 6-19 and described in Table 6-12.

RCOS Installation (Internal Option)

An RCOS3A PCB can be installed on the RCOU3A or RCOU1A for four more loop start lines (for a total of eight lines–the RCOS circuits provide the same options as the RCOU). Each RCOS circuit has surge absorbers for secondary protection.

Excessive loudness which is caused by close proximity to a CO or PBX telephone can be fixed through the RCOS and RCOU decibel (dB) Pad switches. RCOS dB switches SW501, SW601, SW701, and SW801 and RCOU dB switches SW101, SW201, SW301, and SW401 provide a -3 dB signal level drop between the PBX and CO when set to position 3. Switches are factory-set at the 0 (0 dB signal level drop) position.

The RCOS3A and RCOS1A PCBs are shown in Figures 6-16 and 6-17 and described in Tables 6-10 and 6-11.

➤ **To install an RCOS3A PCB**

1. If the Strata CTX system is within one mile of the PBX or CO, set the RCOS dB Pad switches SW501, SW601, SW701, and SW801 to the 3 (-3 dB signal level drop) position. Set the RCOU dB Pad switches to position 3 also.

Note RCOU male connectors P11, P12, P13, and P14 are positioned to allow installation of the RCOS only in the proper position.

2. Mate the RCOS3A female connectors J11, J12, J13, and J14 (Figure 6-16) to the RCOU3A or RCOU1A male connectors P11, P12, P13, and P14 (Figures 6-18 or 6-19).
3. (RCOS3A only) For Mexico, the U.K, or Asia, insert the short jumper plug on the A Law side. For the U.S. and Canada, no plug is required. (No plug is the Mu Law assignment).
4. Apply firm, even pressure to the RCOS to ensure proper mating of connectors.

Note The RCOS1A cannot be installed on the RCOU3A.

Table 6-10 RCOS3A Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
CO line circuit 5~8 indicators	Red LED	Lights to indicate that line circuit is in operation. (CO line indicator will not light unless RCOU is connected to a CO line).
J3 connector	Modular connector	Interface connector for CO line circuits 5 and 6.
J4 connector	Modular connector	Interface connector for CO line circuits 7 and 8.
Pad switch SW501 (circuit 5)	2-position slide switch	Enables -3dB signal level drop for CO line circuit.
Pad switch SW601 (circuit 6)		
Pad switch SW701 (circuit 7)		
Pad switch SW801 (circuit8)		
RCOU3A connector J11, J12, J13, J14	11-pin female connector	Interface connector for RCOU3A. RCOS3A can be connected with RCOU3A and RCOU1A.
Mu Law/A Law jumper plug P2 (RCOS3A only)	3-terminal jumper	No jumper plug is the default for the U.S. and Canada. For countries requiring A Law, insert the jumper plug (provided in the PCB box) on the A Law side.

Table 6-11 RCOS1A Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
CO line circuit 5~8 indicators	Red LED	Lights to indicate that line circuit is in operation. (CO line indicator will not light unless RCOU is connected to a CO line).
J3 connector	Modular connector	Interface connector for CO line circuits 5 and 6.
J4 connector	Modular connector	Interface connector for CO line circuits 7 and 8.
Pad switch SW501 (circuit 1)	2-position slide switch	Enables -3dB signal level drop for CO line circuit.
Pad switch SW601 (circuit 2)		
Pad switch SW701 (circuit 3)		
Pad switch SW801 (circuit 4)		
RCOU connector J11, J12, J13, J14	Female connector	Interface connector for RCOU 4-circuit loop start CO line unit.

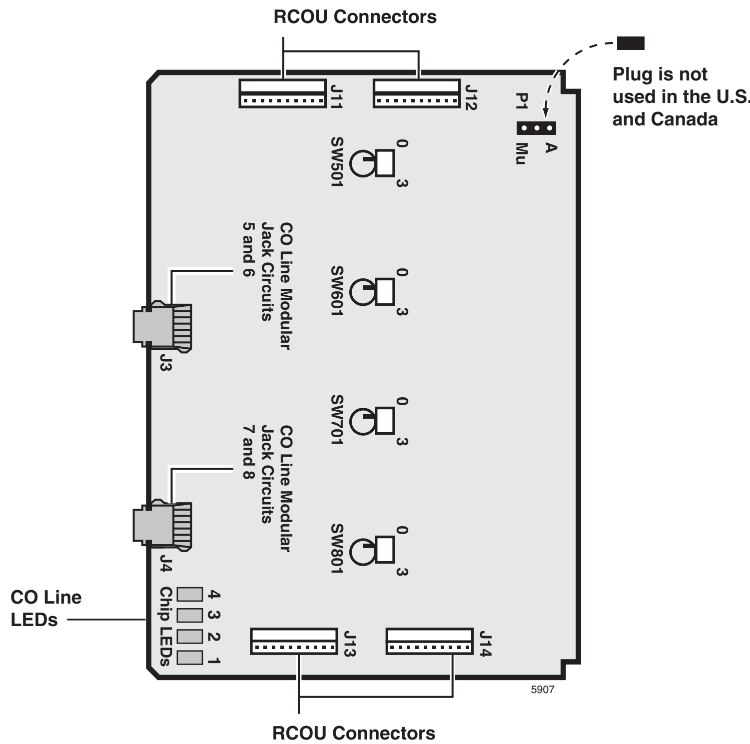


Figure 6-16 RCOS3A PCB

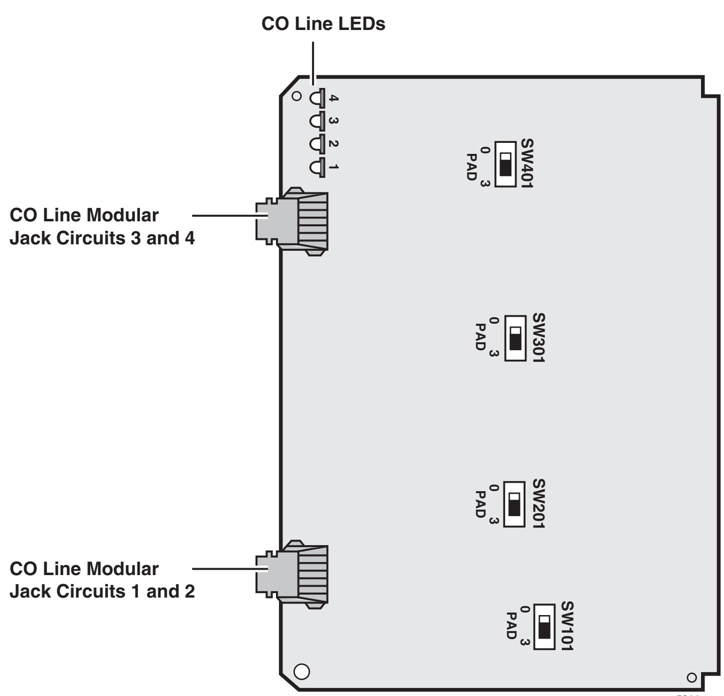


Figure 6-17 RCOS PCB

RCOU Installation

Note The decibel (dB) Pad switches SW101, SW201, SW301, and SW401 control excessive loudness resulting from close proximity to a Central Office or PBX telephone office by providing a -3 dB signal level drop to, or from, the PBX or CO when set to the 3 position. Switches are factory-set to the 0 (0 dB signal level drop) position.

➤ **To install an RCOU3A or RCOU1A PCB**

1. If the Strata CTX system is within one mile of the PBX or Central Office, set the RCOU dB Pad switches SW101, SW201, SW301, and SW401 to the 3 (-3 dB signal level drop) position.
2. (RCOU3A only) For Mexico, the U.K, or Asia, insert the short jumper plug on the A Law side. For the U.S. and Canada, no plug is required. (No plug is the Mu Law assignment).
3. Insert the RCOU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors. PCOU2 can be installed in place of RCOU, see the appropriate Configuration chapter.
4. After installing the RCOU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

Table 6-12 RCOU3A and RCOU1A Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
CO line circuit 1~4 indicators	Red LED	Lights to indicate that line circuit is in operation. (CO line indicator will not light unless RCOU is connected to a CO line).
J1 connector	Modular connector	Interface connector for CO line circuits 1 and 2.
J2 connector	Modular connector	Interface connector for CO line circuits 3 and 4.
Pad switch SW101 (circuit 1)	2-position slide switch	Enables -3dB signal level drop for CO line circuit.
Pad switch SW201 (circuit 2)		
Pad switch SW301 (circuit 3)		
Pad switch SW401 (circuit 4)		
RCOS connector P11, P12, P13, P14	10-pin male connector	Interface connector for RCOS 4-circuit loop start CO line unit.
Mu Law/A Law jumper plug P2 (RCOU3A only)	3-terminal jumper	No jumper plug is the default for the U.S. and Canada. For countries requiring A Law, insert the jumper plug (provided in the PCB box) on the A Law side.

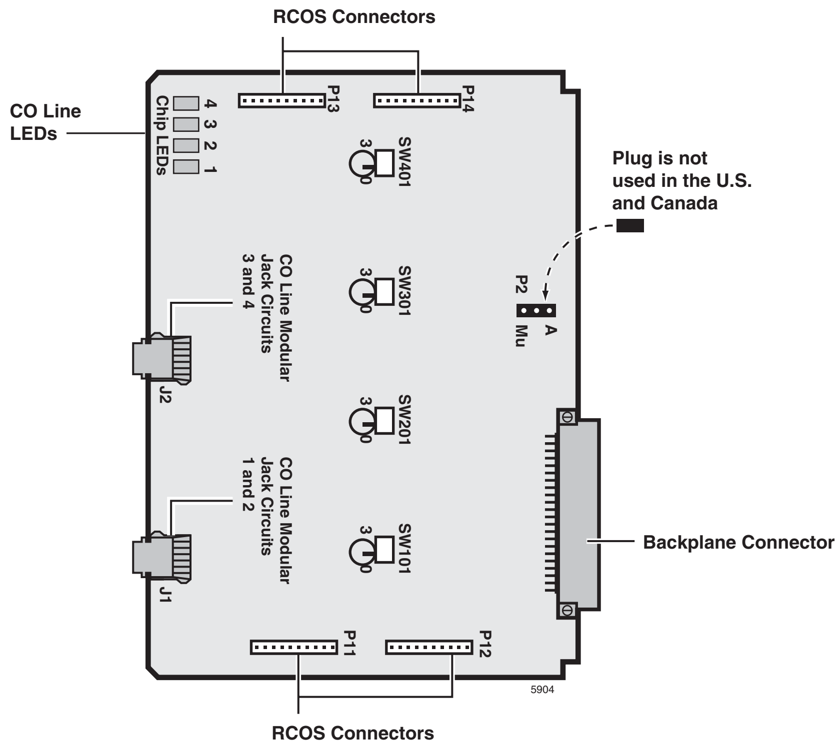


Figure 6-18 RCOU3A PCB

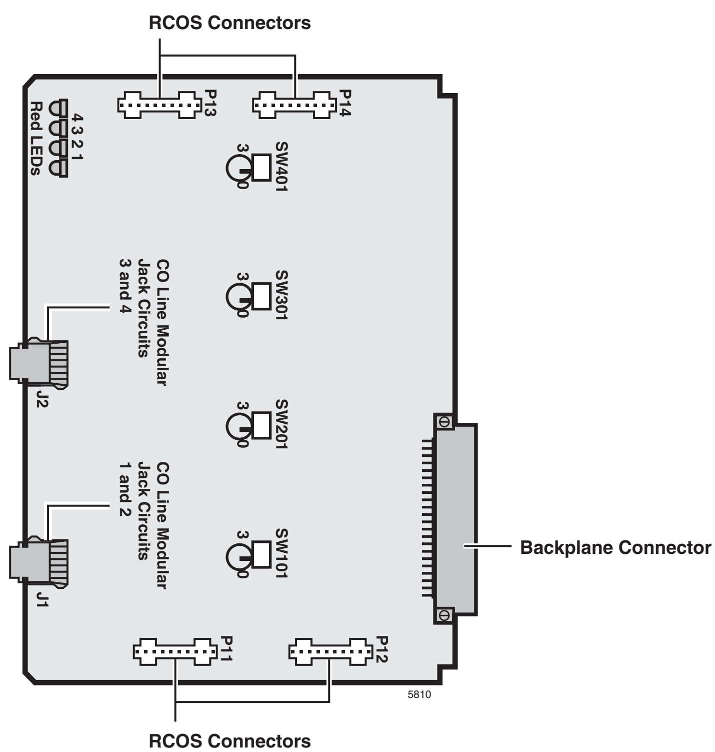


Figure 6-19 RCOU PCB

Table 6-13 PCOU2 Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
CO line circuit 1 CD112	Red LED	Lights to indicate that line circuit is in operation. CO line indicator will not light unless PCOU is connected to a CO.
CO line circuit 2 CD212		
CO line circuit 3 CD312		
CO line circuit 4 CD412		
J1 connector	Modular connector	Interface connector for CO line circuits 1 and 2.
J2 connector		Interface connector for CO line circuits 3 and 4.
Pad switch SW101 (circuit 1)	2-position slide switch	Enables -3dB signal level drop for CO line circuit.
Pad switch SW201 (circuit 2)		
Pad switch SW301 (circuit 3)		
Pad switch SW401 (circuit 4)		

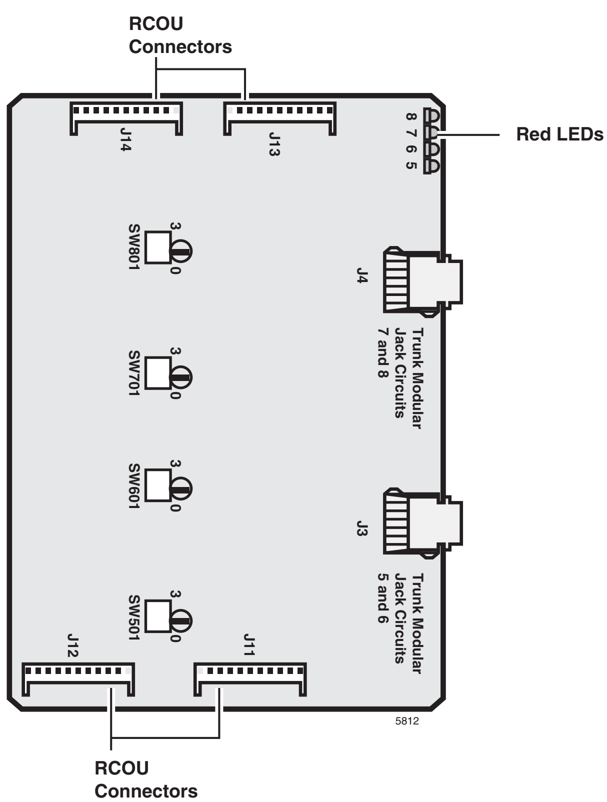


Figure 6-20 PCOU2 PCB

PCB Installation

RDDU – Direct Inward Dialing Line Interface Unit

Circuits per PCB: *four DID lines*

Interfaces with: *DID (one or two-way) lines*

Older Version(s): *none*

The RDDU provides four Direct Inward Dialing (DID) lines, each of which can have a single office code along with a block of extensions.

Each extension can be assigned to ring a station [DN] that appears on one or multiple stations, Distributed Hunt or ACD Group, or an external telephone number selected in system programming. This enables calls over the same line to be routed to different stations or groups of stations. An extension can also be assigned to ring the maintenance modem. Each RDDU can be set for either wink start or immediate. All RDDU lines support DNIS and ANI features.

RDDU controls, indicators, and interface connectors are shown in Figure 6-21 and described in Table 6-14.

RDDU Installation

Note Switches are factory-set to the 0 (0 dB signal level drop) position.

1. If the KSU is located within one mile of the PBX or CO, set dB Pad switches SW101 through SW401 to the 3 (-3 dB signal level drop) position to control excessive loudness resulting from close proximity to the PBX or CO.
2. Sensitivity jumpers P101~P401 are used mostly for dial pulse operation, to adjust for dial pulsing at different loop lengths. If close to the central office, the sensitivity should be set for low (L); as the loop length increases, it should be set to medium (M), then high (H).
3. Insert the RDDU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors.
4. After installing the RDDU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

Table 6-14 RDDU Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
Pad switch SW101 (circuit 1)	3-position slide switch	Enables -3 dB signal level drop for line circuit.
Pad switch SW201 (circuit 2)		
Pad switch SW301 (circuit 3)		
Pad switch SW401 (circuit 4)		
J1 connector	Modular connection	Interface connector for DID line circuits 1 & 2
J2 connector	Modular connection	Interface connector for DID line circuits 3 & 4
DID line circuit 1 CD122	Red LED (top)	Lights to indicate line circuit is in operation. (Trunk indicator will not light unless RDDU is connected to a DID line.)
DID line circuit 2 CD222	Red LED	
DID line circuit 3 CD322	Red LED	
DID line circuit 4 CD422	Red LED (bottom)	
Jumper plug P101	3-terminal jumper plug	Adjusts for dial pulsing at different loop lengths.
Jumper plug P201		
Jumper plug P301		
Jumper plug P401		

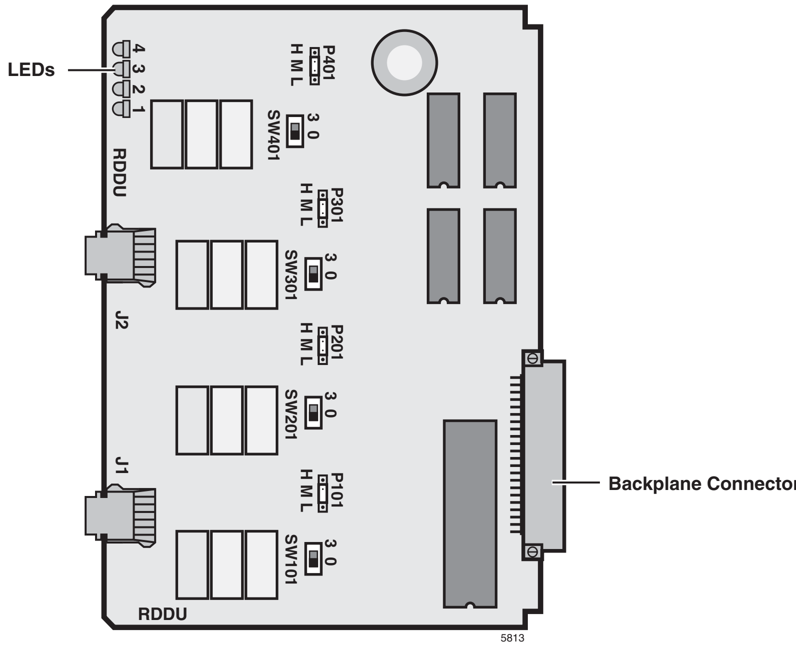


Figure 6-21 RDDU Controls, Indicators, and Interface Connectors

RDSU – Digital/Standard Telephone Interface Unit

Circuits per PCB: ***(with RSTS)*** *four standard telephone (circuits 1~4)/four digital telephone (circuits 5~8)*
(without RSTS) *two standard telephone circuits (1 and 2)/four digital telephone circuits*

Interfaces with: ***digital circuits*** *(see PDKU)*
digital telephones

standard circuits
standard telephones
voice mail ports
off-premises stations
other similar devices
alternate BGM source
auto attendant digital announcer
message waiting lamp

Older Version(s): *none*

An optional Standard Telephone Interface Subunit (RSTS) can be attached to the RDSU to provide two more standard telephone ports (circuits 3 and 4).

RDSU and RSTS controls and interface connectors are shown in Figure 6-22. RDSU interface connectors are described in Table 6-15.

Note For the system to recognize the DTMF tones generated by incoming DID lines a DTMF Receiver Unit (RRCS -4, -8, or -12) must be installed on the processor PCB.

Installing R48S Ring Generator (Internal Option)

An optional R48S unit can be connected to the RDSU or RSTU to change the standard telephone loop voltage from -24VDC to -48VDC, extending the standard telephone circuit loop length (including the resistance of the phone) from 600 ohms to 1200 ohms. The features provided by the R48S apply to the RSTS circuits as well as the basic RDSU standard telephone circuits.

➤ **To install the R48S on the RDSU**

➤ Mate the R48S connectors R6 and R7 with the RDSU connectors R6 and R7. RDSU connectors P6 and P7 are positioned to allow installation of the R48S only in the proper position (Figure 6-5).

Installing RSTS (Internal Option)

➤ Mate the RSTS connectors P2~P5 with the RDSU connectors P2~P5. RDSU connectors P2~P5 are positioned to allow installation of the RSTS only in the proper position (Figure 6-22).

RDSU Installation

1. Ensure the SSTU subunit and optional subassemblies are securely attached to the RDSU (Figure 6-22).

WARNING!	**The protective shield on the back of the RDSU is designed to protect the installer from potentially hazardous ring voltage. Do not remove this shield.**

2. Insert the RDSU into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors.

3. After installing the RDSU gently pull the RDSU outward. If the connectors are properly mated, a light resistance is felt.

Table 6-15 RDSU, RSTS Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
RSTS connector P2/P3	10-pin connector	Connector for RSTS subassembly that provides two standard telephone circuits.
RSTS connector P4/P5		
R48S connector to P6	8-pin connector	Interface connector for R48S.
R48S connector to P7	6-pin connector	

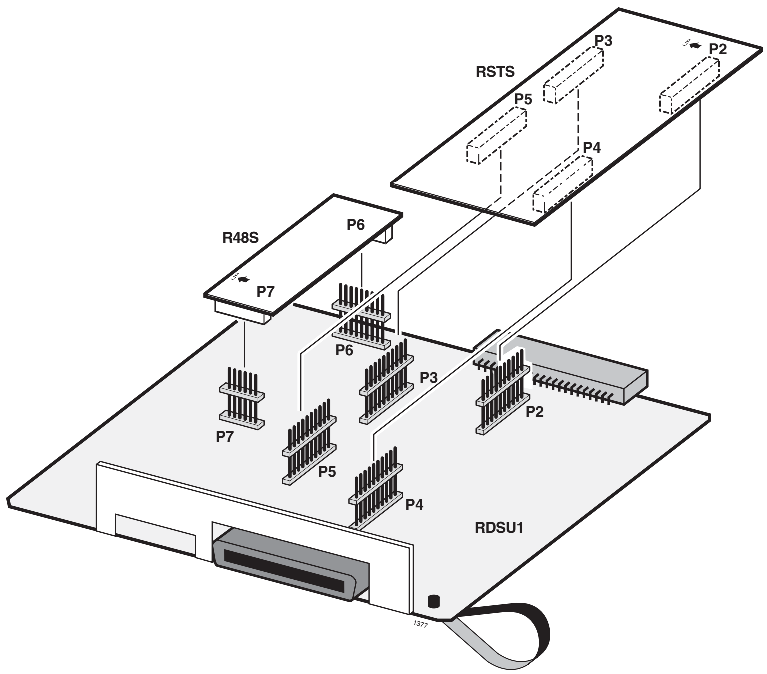


Figure 6-22 RDSU, RSTS PCBs

PCB Installation

RDTU2 – T1 Interface Unit

See Chapter 8 – T1 for RDTU PCB installation information.

REMU2A – Tie Line Unit

Circuits per PCB:	*four Tie line circuits*
Interfaces with:	*E&M Tie lines* *2- or 4-wire transmission* *Type I and II Signaling* *Immediate and Wink Start*
Older Version(s):	*REMU1 (Does not have Mu Law/A Law jumper plug)* *PEMU (Type I signaling & immediate start only, does not provide Pad switches)*

The REMU2A has four decibel (dB) Pad switches which can be set to reduce excessive loudness resulting from close proximity to a central office or PBX by providing a -3 dB signal level drop to the PBX or central office. (Pad is for Transmit and Receive for 2W operation, and Transmit only is for 4W operation.)

REMU2A and REMU controls, indicators, and interface connectors are shown in Figures 6-23, 6-24 and described in Table 6-16.

PEMU controls, indicators, and interface connectors are shown in Figure 6-25 and described in Table 6-17.

REMU2A and REMU Installation

1. Set the 2W/4W jumper plugs SW103~SW403 to the appropriate positions.
2. Set the P102/104, P202/204, P302/304, and P402/404 jumper plugs for Type 1 or Type 2 signaling.
3. If the system is located within one mile of the PBX or central office, set the REMU dB Pad switches SW101, SW201, SW301, and SW401 to the 3 (-3 dB signal level drop) position.
4. (REMU2A only) Make sure the jumper plugs for P105, P205, P305 and P405 are set to the TYP1,2 (default), unless the unit is used in the U.K. or Japan, in which case the plug should be moved to DC5.
5. (REMU2A only) Do not change the position of the jumper plug on P2 selects Mu Law (default). However, if the unit is used in Mexico, the U.K, or Asia, move the jumper plug to A Law.
6. Insert the REMU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors.
7. After installing the REMU, gently pull it outward. If the connectors are properly mated, a slight resistance is felt.

PEMU Installation

1. Determine if the E&M Tie lines will be configured for 2- or 4-wire transmission.
2. Set the 2W/4W jumper plugs P103, P203, P303, and P403 to the appropriate positions.
3. Set the FG jumper plug P3 to the “2-3” position.
4. Set all GND/BAT jumper plugs to the “BAT” position for connection to the telephone network.

Note The "GND" position is used to connect PEMU circuits back-to-back on premises only, 1000 feet maximum (E&M lead wires must be crossed).

5. Insert the PEMU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors.)
6. After installing, gently pull the PEMU outward. If the connectors are properly mated, a slight resistance is felt.

Table 6-16 REMU2A and REMU1A Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
Tie trunk circuits 1~4 (CD102, 202, 302, and 402)	Red LED	Lights to indicate that Tie line is in operation.
E&M Tie trunk connector circuits 1~4 (J101, 201, 301, and 401)	Modular connector	Interface connector for E&M Tie line circuit.
Pad switch SW101 (circuit 1)	2-position slide switch	Enables -3 dB signal level drop for line circuit.
Pad switch SW201 (circuit 2)		
Pad switch SW301 (circuit 3)		
Pad switch SW401 (circuit 4)		
TYP1/TYP2 jumper plugs P102/104	3-terminal jumper	Enables line circuit to be set for Type 1 or Type 2 signaling.
TYP1/TYP2 jumper plugs P202/204		
TYP1/TYP2 jumper plugs P302/304		
TYP1/TYP2 jumper plugs P402/404		
2W/4W switch 102 (circuit 1)	2-position slide switch	Selects 2- or 4-wire configuration for E&M Tie line circuit.
2W/4W switch 202 (circuit 2)		
2W/4W switch 302 (circuit 3)		
2W/4W switch 402 (circuit 4)		
TYP1,2/DC5 jumper plugs P105, P205, P305, P405 (REMU2A only)	3-terminal jumper	For most countries, use the default position (TYP1,2). In the U.K. and Japan, place the jumper plug on DC5.
Mu Law/A Law jumper plug P2 (REMU2A only)	3-terminal jumper	Do not move the jumper plug which is in the default for the U.S. and Canada. For countries requiring A Law, place the jumper plug (provided in the PCB box) on the A Law side.

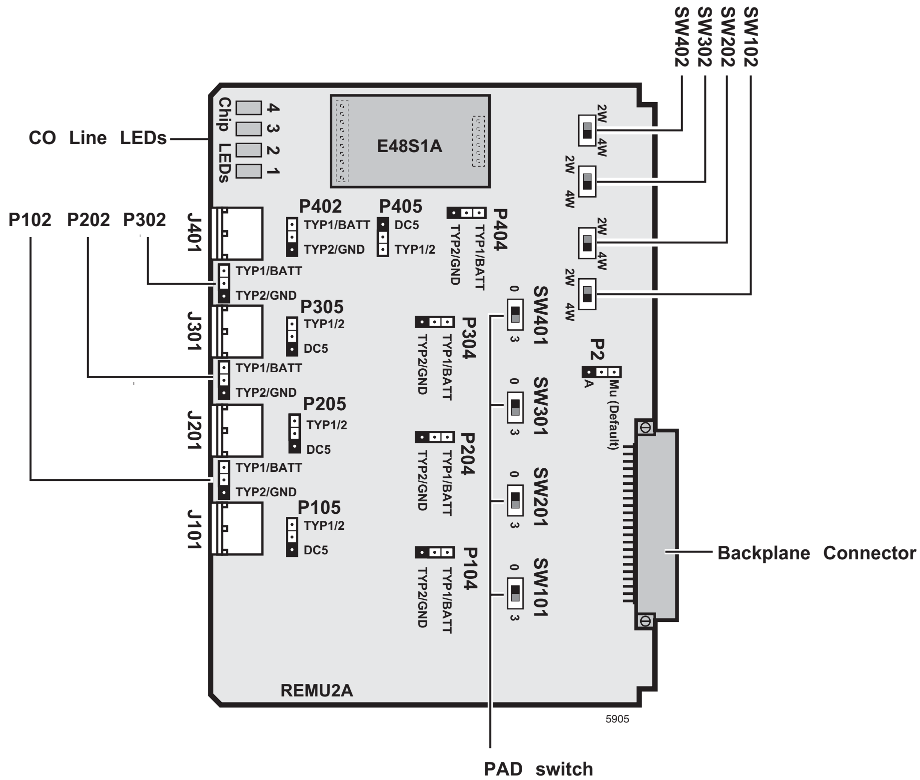


Figure 6-23 REMU2A PCB

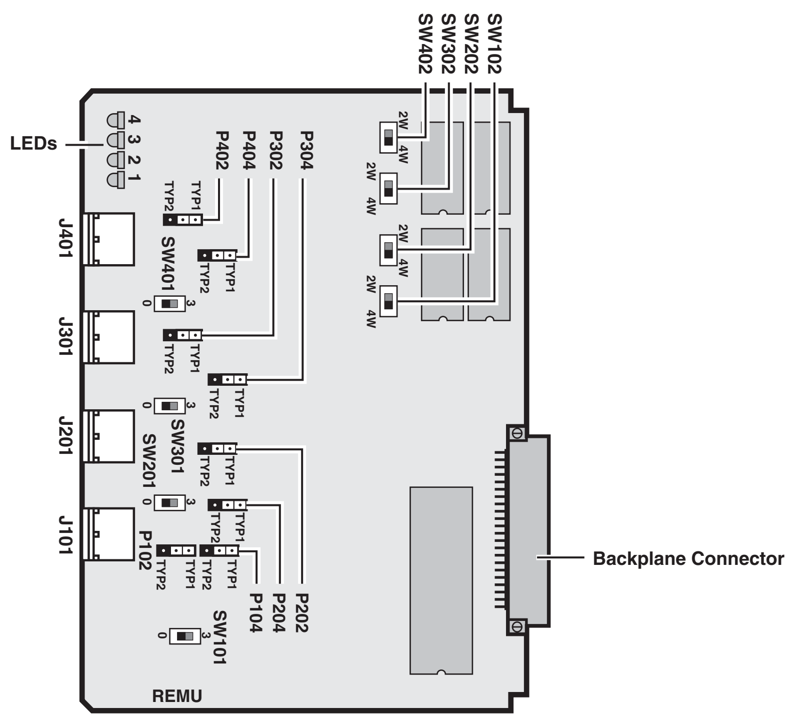


Figure 6-24 REMU PCB

Table 6-17 PEMU Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
Tie trunk circuit 1~4 (CD102, 202, 302, and 402)	Red LED	Lights to indicate that Tie line is in operation.
E&M Tie line connector J101, 201, 301,and 401 (circuit 1~4)	Modular connector	Interface connector for E&M Tie line circuit.
FG jumper P3	3-terminal jumper	Enables or disables -48VDC ground to FG.
GND/BAT jumper P101	3-terminal jumper (Tie line 1)	Enables -3 dB signal level drop for line circuit.
GND/BAT jumper P102		
GND/BAT jumper P201	3-terminal jumper (Tie line 2)	
GND/BAT jumper P202		
GND/BAT jumper P301	3-terminal jumper (Tie line 3)	M-lead origination for Tie line (must be in BAT position per FCC requirements.
GND/BAT jumper P302		
GND/BAT jumper P401	3-terminal jumper (Tie line 4)	
GND/BAT jumper P402		
2W/4W switch P103, 203, 303, and 402 (circuit 1~4)	3-terminal jumper	Selects 2- or 4-wire configuration for E&M Tie line circuit.

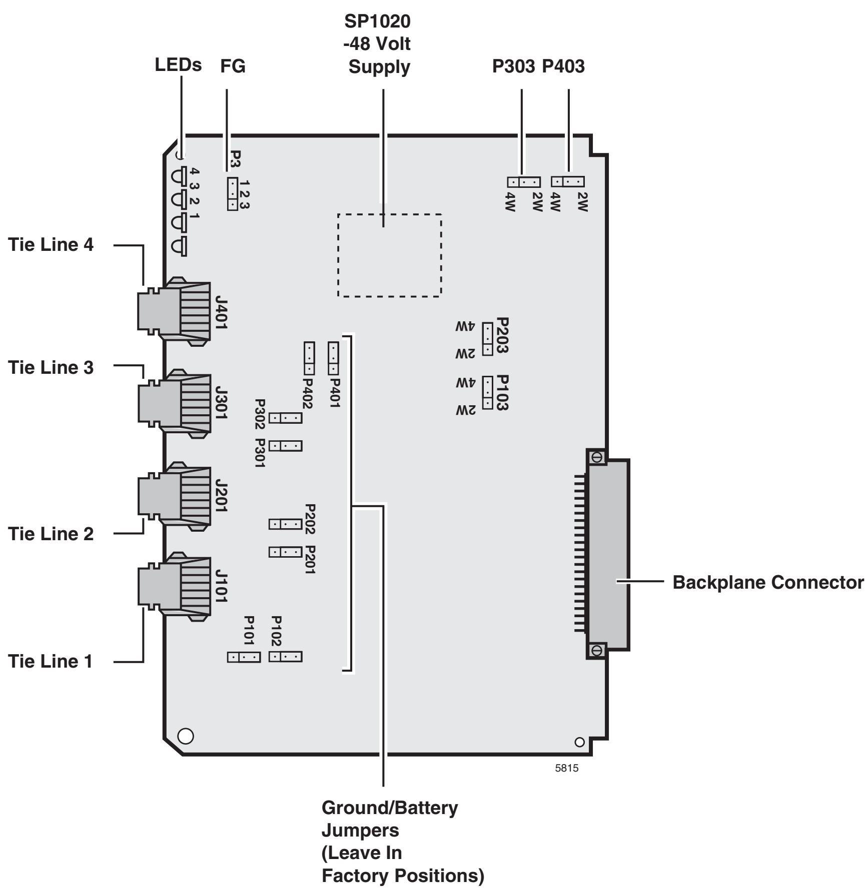


Figure 6-25 PEMU PCB

RGLU2 – Loop/Ground Start CO Line Interface Unit

Circuits per PCB: *four line circuits*
Interfaces with: *loop or ground start lines*
Older Version(s): *RGLU1 (does not have hookflash to CO)*

The RGLU2 also provides ring detection, dial outpulsing, and hold. Each RGLU2 line can be programmed for DTMF or dial pulse signaling and gas tube secondary protection.

RGLU2 controls, indicators, and interface connectors are shown in Figure 6-26 and described in Table 6-18.

RGLU2 Installation

Note The decibel (dB) Pad switches SW101, SW201, SW301, and SW401 control excessive loudness resulting from close proximity to a central office or PBX telephone office by providing a -3 dB signal level drop to, or from, the PBX or central office when set to the 3 position. Switches are factory set to the 0 (0 dB signal level drop) position.

➤ **To install an RGLU2 PCB**

1. If the Strata CTX670 is within one mile of the PBX or central office, set the dB Pad switches SW101, SW201, SW301, and SW401 to the 3 (-3 dB signal level drop) position.
2. Set each line for ground start (GND) or loop start (LOOP) by setting the following jumper plugs: SW103 for line 1, SW203 for line 2, SW303 for line 3, and SW403 for line 4.
3. Insert the RGLU2 (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors.
4. After installing the RGLU2, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

Table 6-18 RGLU2 Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
Line circuit 1	Red LED	Lights to indicate that line circuit is in operation. CO line indicator will not light unless RGLU2 is connected to a line.
Line circuit 2		
Line circuit 3		
Line circuit 4		
J1 connector	Modular connector	RJ14 modular Interface connector for trunk circuits 1 and 2.
J2 connector	Modular connector	RJ14 modular Interface connector for trunk circuits 3 and 4.
Pad switch SW101 (circuit 1)	2-position slice switch	Enables -3dB signal level drop for trunk circuits.
Pad switch SW201 (circuit 2)		
Pad switch SW301 (circuit 3)		
Pad switch SW401 (circuit 4)		

Table 6-18 RGLU2 Controls, Indicators, and Connectors *(continued)*

Control/Indicator/ Connector	Type of Component	Description
LOOP/GND jumper SW103 (configures line 1)	3-terminal jumper	Used to configure line for loop or ground start.
LOOP/GND jumper SW203 (configures line 2)		
LOOP/GND jumper SW303 (configures line 3)		
LOOP/GND jumper SW403 (configures line 4)		

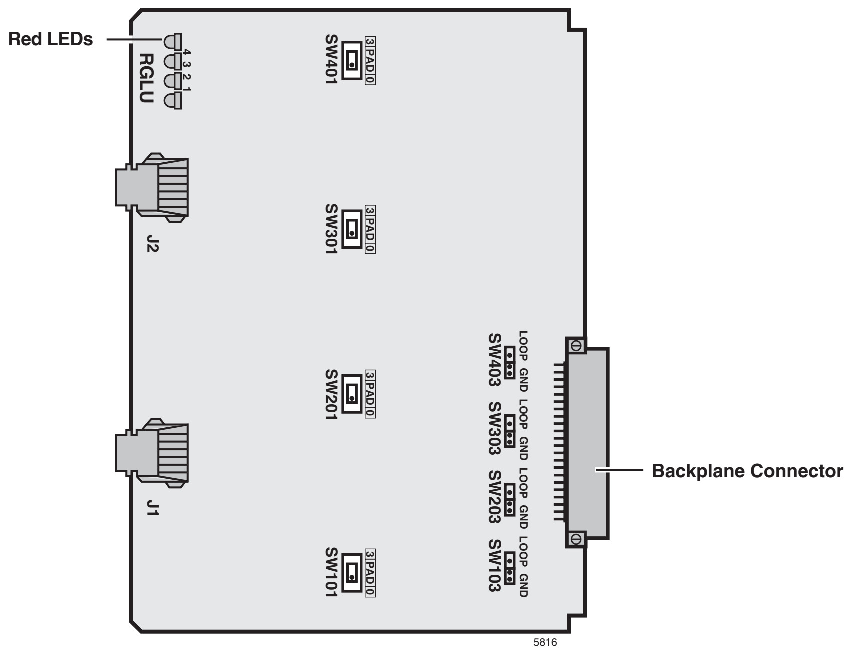


Figure 6-26 RGLU2 PCB

RMCU/RCMS – E911 CAMA Trunk Direct Interface

Circuits per PCB: *four circuits*

Interfaces with: *enhanced 911 locator services*

Older Version(s): *none*

The E911 CAMA Trunk Direct Interface card (RMCU) enables cost-effective connection to the Enhanced 911 locator services without third-party equipment. Figure 6-29 shows the RMCU. The RMCU supports two subassemblies (RCMS) that provide a total of up to four ports as shown in Figure 6-27. Only one RMCU PCB can be installed in a Strata CTX670 system.

The RMCU has no CAMA circuits. It requires one RCMS subassembly to provide one or two CAMA trunks and two RCMS PCBs to provide up to four CAMA trunks.

Location of the RCMS LEDs are shown in Figure 6-30 and the functions of the RCMS LEDs are given in Table 6-19.

RCMS Subassemblies Installation

1. Attach one or two subassemblies (RCMS) to the connectors on the RMCU as shown in Figure 6-27. If only one RCMS is to be installed, install it in the bottom position.
2. Apply firm even pressure to ensure that the connectors are properly seated in the RMCU connector blocks. If they are seated properly, a light resistance is felt when you pull the units away from the RMCU.

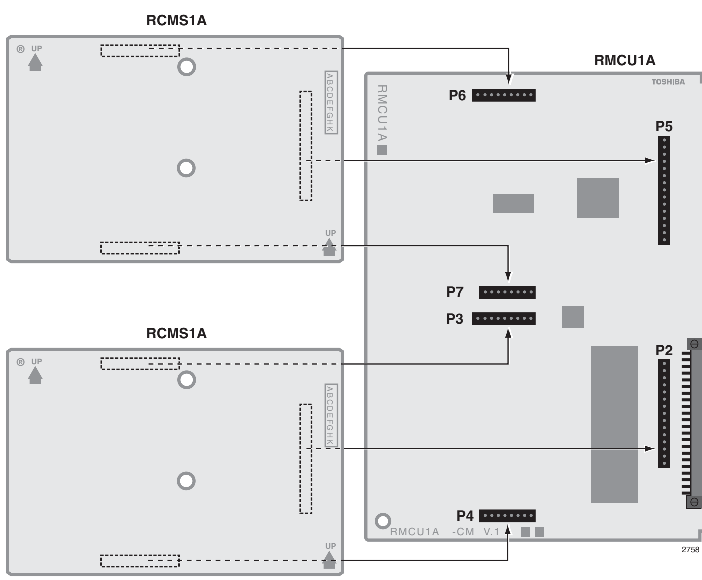


Figure 6-27 Placement of RCMS Subassemblies on the RMCU Interface Card

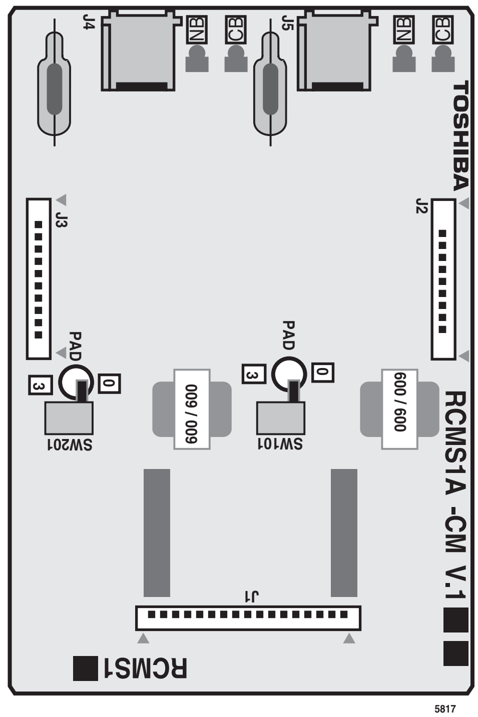


Figure 6-28 RCMS Subassembly (stand-alone)

Table 6-19 RCMS Subassembly Controls, Indicators, and Connectors

Controls, Indicators, & Connectors	Type of Component	Description
SW101	Switch	3-dB Pad switch for circuit 1 or 3.
SW201	Switch	3-dB Pad switch for circuit 2 or 4.
J1	Connector Blocks	Jacks to connect to RMCU.
J2		Jacks to connect to RMCU.
J3		Jacks to connect to RMCU.
RJ11	6-pin modular connector	Network interface jack to CAMA trunk.

RMCU Installation

1. Insert the RMCU (component side facing right) into the appropriate slot, and apply firm, even pressure to ensure proper seating of the connectors.
2. Gently pull the unit outward. If the connectors are properly seated, a light resistance is felt.
3. Wire the RCMS jacks, J4 and J5, to the network CAMA trunks per Figure 10-9 on page 10-17.
4. Test the CAMA trunk and set the 3-dB Pad switches, SW101 and SW 201, for the appropriate volume level.

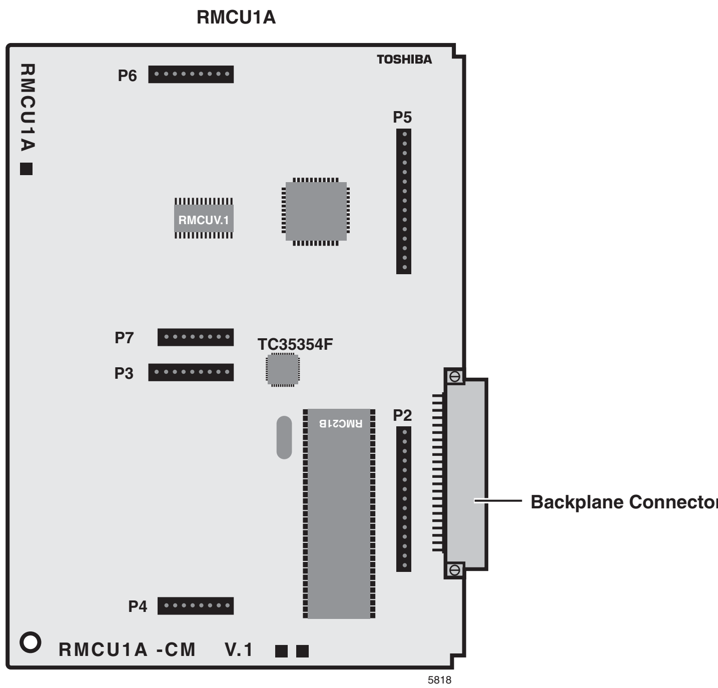


Figure 6-29 RMCU Interface Card

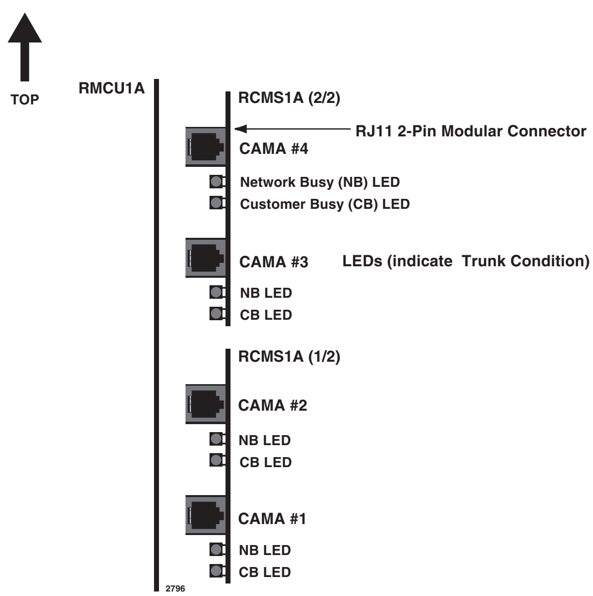


Figure 6-30 Location of the RCMS LEDs

RCMS LEDs

Customer Busy (CB) LEDs – The RMCU firmware controls this LED synchronizing with off-hook status inside switch.

Network Busy (NB) LEDs – RMCU hardware controls this LED synchronizing with the supply of voltage from the carrier.

Table 6-20 LED Indications (Normal Operation)

Status		NB LED (Network Busy)	CB LED (Customer Busy)
1	No network connection. RMCU is in stand-by mode.	On	Off
2	Network connected. RMCU is in stand-by mode.	Off[1]	Off
3	Network is in stand-by mode and the RMCU is off hook. Network is connected and the RMCU MF sending dial tone.	Off	On
4	Network is seizing and the RMCU is off-hook.	Flashing	On
5	Network is connecting, before ANI is sent, and the RMCU is sending. Network is connecting and the RMCU is communicating.	On	On
6	Network is disconnecting first and then the RMCU disconnects.	On then Off NB is turned off, then approx. 400 msec after CB is turned off.	On then Off
7	RMCU is disconnecting first and then the network disconnects.	On then Off NB is turned off within 700 msec after CB is turned off.	On then Off

1. If the NB LED stays On, even if the modular connector of the network is connected, check the following:
    - Tip and Ring could be reversed.
    - Network could be busy.

Network Requirements

The system network requirements are provided in Table 6-21.

Table 6-21 PCB Network Requirements

PCB/Interface	Facility Interface Code	Network Jack	Ringer Equivalence	Universal Service Order Code
RSTU2/RDSU[1] (Off-premises Station)	OL13B (RSTU2, –24V) OL13C (RSTU2, RDSU with R48S-48V)	RJ21X	N/A	9.0F
RCOU/RCOS[2] (loop start line)	02LS2	RJ14C/RJ21X (all others)	0.3B	N/A
RDDU	02RV2-T (Dealer-supplied CSU)	RJ14C/RJ21X	0.0B	AS.2
REMU type 1 or type 2	TL11M, 2-wire TL31M, 4-wire TL12M, type 2, 2-wire TL32M, type 2, 4-wire	RJ2EX RJ2GX RJ2FX RJ2HX	Not Available (N/A)	9.0F
RGLU2[2] (ground or loop start line)	02GS2 (ground) 02LS2 (loop)	RJ14C/RJ11CX	0.3B	N/A
RDTU (DS-1/T1)[3]	(See last bullet note on Note 2 below.)	RJ48C/RJ48X/ RJ48M	N/A	6.0P
RCIU2/RCIS (Caller ID)	N/A	RJ21X/RJ14C	0.3B	N/A
RPTU (PRI)[4, 5]	04DU9-1SN (Dealer-supplied CSU)	RJ48C/RJ48M	N/A	6.0P
RPTU (QSIGI)	04DU9-1SN (Dealer-supplied CSU)	RJ48C/RJ48M		
RBSU/RBSS (S/T, BRI)[3]	02IS5 (Dealer-supplied NT-1)	RJ48C/RJ48X		
RBUU/RBUS (U, BRI)[3]	02IS5	RJ48C/RJ48X		
RMCU/RCMS (CAMA)	02RV2-O	RJ11C/RJ21-X		

1. Only RDSU ckts. 1~4 provide Off-premises Station (OPS) ability. RDSU must use OL13A or OL13B if providing –24 volt loop voltage. If equipped with the –48 volt loop option PCB (R48S), OL13A, OL13B, or OL13C may be used for OPS connection.
2. Loop current requirements for Strata loop and ground start lines: 20 milliamperes (mA) min./120 mA max.
3. When ordering DS-1/T1 circuits, six items must be specified:
   - The number of channels per T1 circuit, fractional increments are normally 8, 12, or 16 channels, full service is 24 channels. Unused channels must be bit-stuffed.
   - CO line types assigned to each channel: Loop Start, Ground Start, Tie (Wink or Immediate Start), DID (Wink or Immediate).
   - Frame Format Type: Super Frame (SF) or Extended Super Frame (ESF). The T1 provider normally specifies the Frame Format to be used, either is adequate for CO digital voice lines. ESF provides a higher level of performance monitoring, but requires trained personnel and the ESF CSU normally costs more than an SF only CSU.
   - Line Code Type: Alternate Mark Inversion (AMI) or Bipolar 8 Zero Substitution (B8ZS). The T1 provider normally specified the Line Code to be used, either is adequate for T1 CO digital voice lines.
   - The customer may have to provide the Channel Service Unit (CSU) to interface the CTX T1 circuit to the Telco T1 circuit. (CSUs are a Telco requirement.)
   - RDTU Network Channel Interface Codes: 04DU9-BN, 04DU9-DNZZ, 04DU9-1SN, 04DU9-1KN, 04DU9-1ZN.
4. For information on how to order ISDN PRI/BRI circuits, you should refer to the Toshiba ISDN Training CBT. ISDN circuits may require a customer-provided CSU for PRI and/or Terminal Adapter or Network Terminal units for BRI. In U.S. CSU/TAs must be UL-listed in the U.S. In Canada, they must be CSA certified.
5. RPTU2 is required for QSIG private networking.

ISDN Interfaces 7

This chapter covers information on the ISDN Primary Rate Interface (PRI) and Basic Rate Interfaces (BRI).

PRI Overview

For PRI services, the Strata CTX uses a BPTU or RPTU PCB to connect to a Public Switched Telephone Network (PSTN) PRI line using a UL listed (or CSA certified in Canada) Channel Service Unit (CSU) in most locations in the U.S. Each BPTU or RPTU provides 23B + D channels. The B-channels support CO speech and data connections on the PSTN side only.

The Strata CTX also uses a BPTU or RPTU2 PCB to connect Strata Net QSIG network nodes using DS-1. A DS-1 may be obtained in several ways, most commonly, leasing it from a carrier.

BRI S/T Overview

BRI S/T is available with the RBSU PCB. The RBSU provides two BRI S/T circuits to connect to the PSTN BRI line using an external UL listed NT1; or, on the station-side, connect to:

- S-type ISDN telephones and Terminal Equipment (TE-1-S)
- S-type Terminal Adapters (TA-S) with non-ISDN devices

Each TE-1-S and TA1-S device can support voice and/or RS-232 switched-circuit data as shown in Figure 7-1. The station-side BRI S/T circuits are point-to-multipoint.

A subassembly (RBSS) can be attached to the RBSU for two additional BRIs for S-type station-side connections only. The RBSU PCB and the RBSS subassembly are shown in Figures 7-11 and Figure 7-12 on page 7-17. The combination of RBSU and RBSS uses only one slot to provide up to four BRI S/T circuits.

Note Each installed RBSU or RBSS circuit provides a 2B + D connection and uses a system capacity of two station ports and two CO lines regardless of the circuit application, even if the circuit is not actually connected.

BRI U Overview

For BRI U services, the RBUU provides two BRI U circuits that connect directly to PSTN BRI lines; or, on the station side, connect to:

- U-type ISDN telephones and Terminal Equipment (TE-1-U)
- U-type Terminal Adapters (TA-U) with non-ISDN devices

  Each TE-1-U and TA-U device can support voice and/or RS-232 switched-circuit data depending on the device (see Figure 7-1). The station-side BRI U circuits are point-to-point.

A subassembly (RBUS) can be attached to the RBUU for two additional BRIs for PSTN and/or U-type station connections. The RBUU PCB and the RBUS subassemblies are shown in Figures 7-23 and Figure 7-24 on page 7-28. The combination of RBUU and RBUS uses only one slot to provide up to four U-type BRI circuits.

Notes

- Each installed RBUU or RBUS circuit provides a 2B + D connection and uses a system capacity of two station ports and two CO lines regardless of the circuit application, even if the circuit is not actually connected.

Strata CTX ISDN Reference Model

A block diagram of the Strata CTX ISDN PCBs and reference points is provided in Figure 7-1.

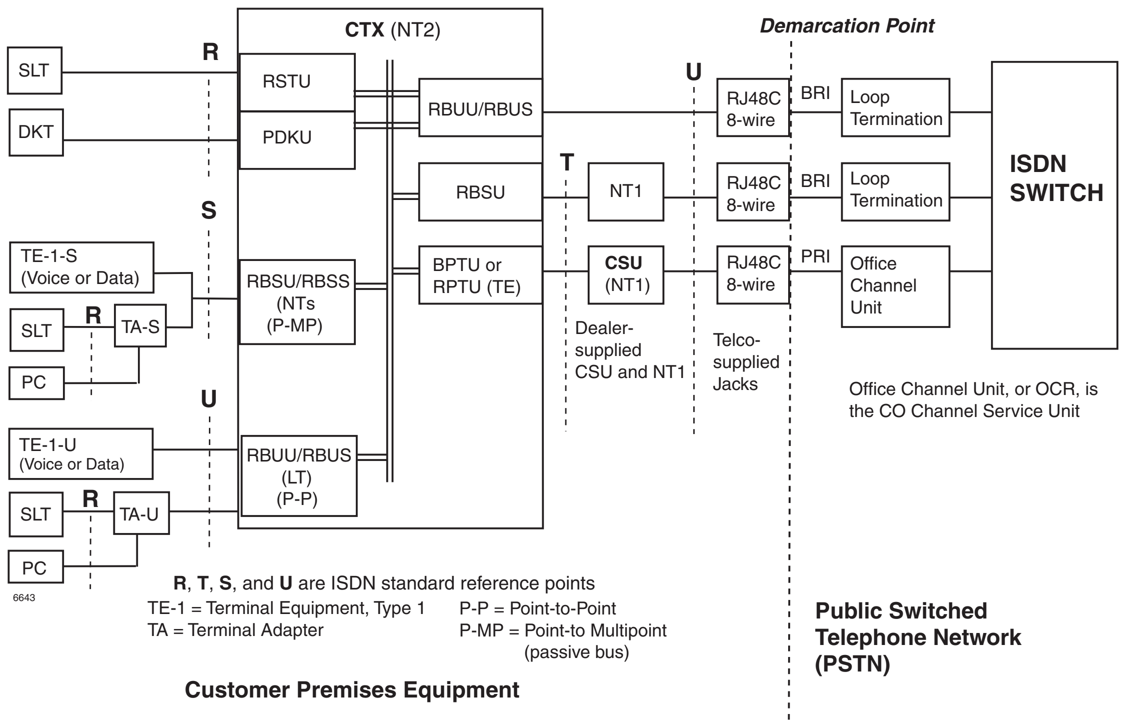


Figure 7-1 ISDN Reference Model

BPTU/RPTU Overview

Both the BPTU and RPTU provides 24 channels for ISDN PRI service. The BPTU is fully compatible with RDTU2 and will replace the RPTU. Network connection using BPTU or RPTU PRI interface requires installation of a customer-provided CSU in most locations of the U.S. Refer to “CSU Requirements” on page 7-3 for CSU installation.

The BPTU or RPTU is a DS-1 divided into 24 TDM channels using standard T1 electrical signal format. The BPTU or RPTU’s D-channel is typically the 24th channel and can control the signaling of 23 of its own B-channels and 24 B-channels of another designated BPTU or RPTU. Each BPTU or RPTU can also use its own D-channel for control.

The BPTU or RPTU’s in-service bit rate is 1.544 mbps (± 4.6 ppm), but during a maintenance session, the rate may vary ± 32 ppm. The BPTU or RPTU provides Binary 8-Zero Substitution (B8ZS) and ESF with Framing Pattern Sequence (FPS) and Cyclical Redundancy Check (CRC) error checking in the framing bits.

Extracting the Stratum-1 clock from the ISDN PRI, BRI, or T1 provider is the most common method used to synchronize the BPTU or RPTU PCB and the Strata CTX time switch to the public telephone network. One BPTU, RPTU, RBSU, RBUU, or RDTU T1 must extract the clock from the ISDN or T1 provider. The selected unit is designated as the “Primary” timing source in Program 105. In remote cabinet applications, the Primary clock source PCB must be installed in the Base Cabinet (main location). For more information, refer to “Timing and Synchronization” on page 7-35.

A dealer-supplied CSU must be installed between the ISDN PRI network line and the BPTU or RPTU PCB as shown in Figure 7-1. Some telephone companies supply the CSU and call it the Network Interface Unit (NIU).

CSU Requirements

In the U.S., the CSU must be UL listed and comply with Part 68 of the FCC rules. It must also comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. In Canada, the CSU must be CSA certified.

The CSU is transparent to data, clock, and framing. It acts as a repeater, not a controller, for timing. The CSU also acts as a signal regenerator and must be able to perform loop-back tests and maintenance to both the network and Strata CTX BPTU or RPTU. The CSU is the same type as used for T1 circuits although it performs the function as NT1 for PRI ISDN in the ISDN reference model as shown in Figure 7-1.

Slot Assignments

Up to eleven BPTU or RPTU PCBs can be installed in a Strata CTX system providing up to 264 PRI lines (B-channels). If BPTU or RPTU (PRI) and RDTU (T1) PCBs are installed, the maximum combined PCBs cannot exceed eleven. The PCBs must be placed in designated slots in each of the cabinets. Refer to Chapter 2 – Strata CTX Configuration, “ISDN PRI Digital Line PCBs” on page 2-40, for the guidelines regarding BPTU or RPTU PCB slot assignments.

BPTU Interface Unit

System: *DK424, DK40i, CTX100 & 670*
Circuits per PCB: *24 channels per PCB*
Interfaces with: *ISDN PRI*
Older Version(s): *none*

The BPTU has an RS-232C port to trace data that is transmitted between the CTX system CPU and the BPTU.

T1 Framing: ESF

Line cording: B8ZS

Digital PAD: Transmit side +6dB to -15dB. Receive side +6dB to -15dB (software controlled)

BPTU Installation

Power Factor

BPTUA uses 5V only. 5V power factor = 2.30

➤ **To install an BPTU PCB**

1. Look for IC19 on the BPTU PCB. If it is on the PCB, move the SW10 jumper to "ROM." If IC19 is not on this PCB, leave the jumper on the "CPU" setting (see Table 7-1).
2. If you want to run the PCB Self Test, refer to BPTU Self Test.
3. Turn the Strata CTX system power Off.
4. Insert the BPTU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper seating of connectors.

   Refer to Chapter 2 – Strata CTX Configuration:

   - "Worksheet 5: Strata CTX100 Cabinet Slots" on page 2-26
     ...or "Worksheet 6: Strata CTX670 Cabinet Slots" on page 2-37
   - "ISDN PRI Digital Line PCBs" on page 2-40 (mentioned above in slot assignments)
5. After installing the BPTU, gently pull the PCB outward. If the connectors are properly seated, a slight resistance is felt.
6. For cabling information and requirements, refer to "BPTU and RPTU Cabling" on page 7-11.

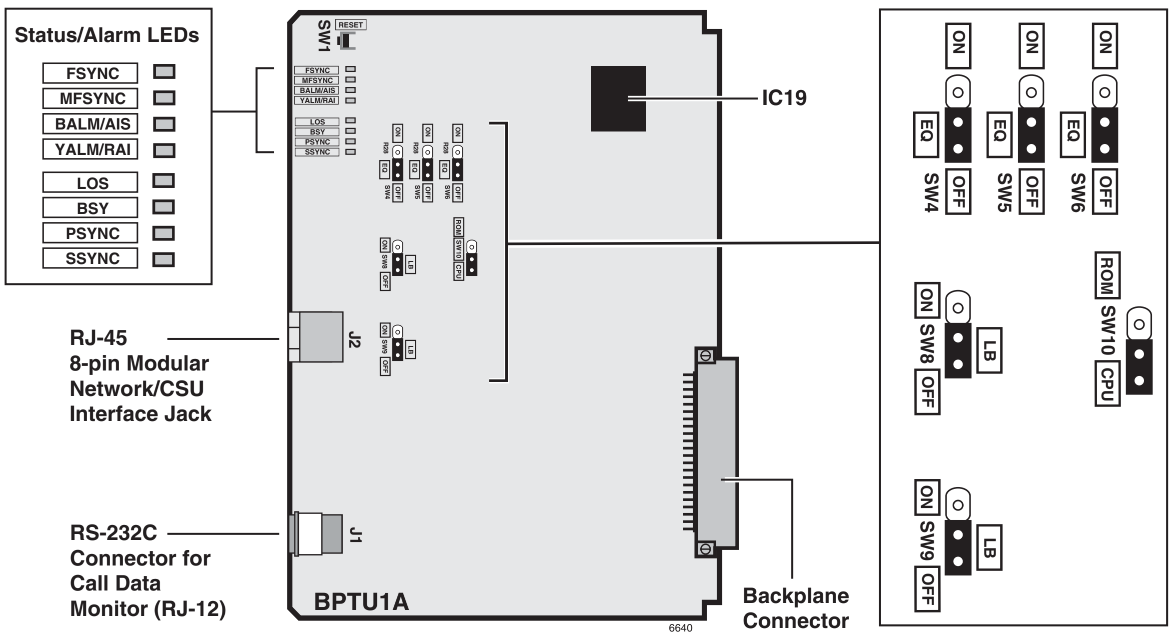


Figure 7-2 BPTU PCB

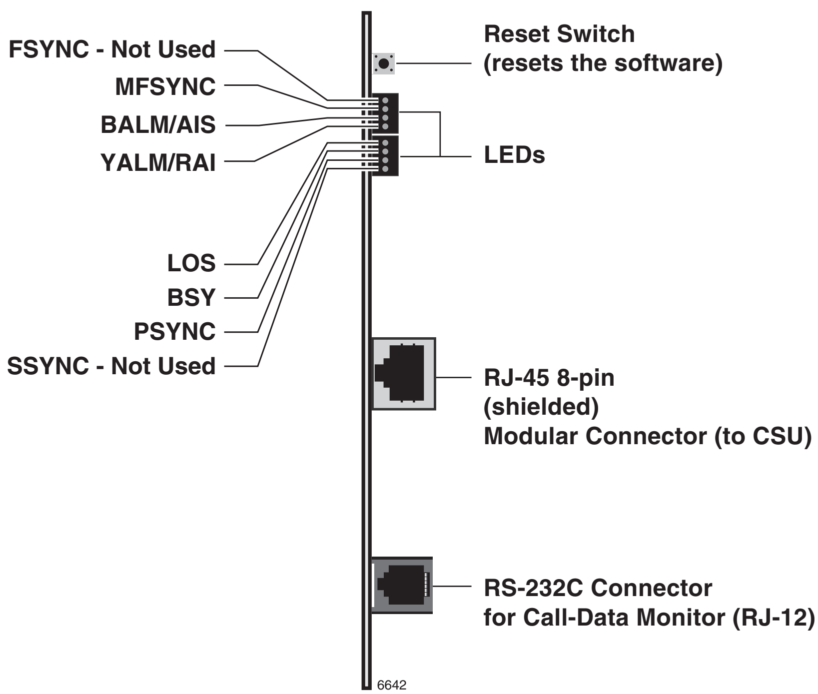


Figure 7-3 BPTU LEDs and Connectors

Table 7-1 SW10 Internal or External ROM Setting

Mode	SW10	Note
Internal ROM (Default mode)	CPU	When there is an internal ROM on the CPU (TMP93PW46), BPTUA operates with the SW10. Use this mode when IC19 is not on PCB. If the SW10 is in CPU position, BPTUA is operating with the internal ROM regardless of IC19 existence.
External ROM (Upgrade)	ROM	BPTUA is operating with the external ROM (IC19). Use this mode only when IC19 is on PCB. If the SW10 is in ROM position without IC19, the BPTUA will not work.

BPTU Self Test

1. Remove the RJ45 network cable to perform the Self Test.
2. Remove the BPTU and set the SW8 and SW9 switches to On (see Table 7-2).
3. Insert BPTU back into the same slot that it was in. If all LEDS turn Off except PSYNCH or SSYNCH, the PCB has passed the self test.
4. After self check passes, put the switches back into position for normal operation (both Off) and insert the BPTU PCB back into the appropriate slot.
5. Plug the RJ45 network cable back in.

Note Do not use the BPTU as a clock extraction unit while in Self Test mode.

Table 7-2 SW8, SW9 BPTUA Self and CSU Test

Mode	SW8 and SW9	Notes
BPTUA self test	Both On	With both SW8 and SW9 On, all LEDS turn Off. If there is more than one BPTU, these LEDs will not flash.
Normal operation (non-loop back)	Both Off	

BPTU Cable Length Equalizer Switches

The distance between the Strata CTX, BPTU and CSU or BPTU to other Customer Premise Equipment (CPE) T1 may vary (0~655 ft.) as shown. (See “BPTU Cabling” on page 7-7.) The BPTU interface transmitter must be equalized and its impedance must be matched to the cable length connecting the BPTU to the CSU or other CPE, T1 (see Table 7-3).

Table 7-3 BPTU Equalizer Setting Switch

Mode	Feet from CTX	SW4	SW5	SW6
Short	0 to 133 feet	Off	Off	Off
Semi-short	133 to 266 feet	On	Off	Off
Medium	266 to 399 feet	Off	On	Off
Semi-long	399 to 533 feet	On	On	Off
Long	533 to 655 feet	X	X	On

X = Doesn’t matter.

BPTU Loop Back Jumper Plugs

The BPTU PCB provides jumper plugs for loop back testing. Loop back tests are described in "Loop-back Test" on page 7-34. See Table 7-2 for switch settings for Loop Back tests.

BPTU Front Panel Indicators

The BPTU PCB provides seven LED indicators to show the status of BPTU: Busy or Idle condition, Alarm status, and Synchronization status.

See Table 7-4 for the function of each status LED. Figure 7-3 on page 7-5 shows the LED locations.

Table 7-4 BPTU LED Functions

BPTU LEDs	Indication
FSYNC	Frame Sync error indication. This LED is not mounted.
MFSYNC	Multi-frame Sync error indication (same with FSYNC) On = No frame synchronization status Off = Frame synchronization status
BALM/AIS	AIS indication On = BPTU is receiving AIS Off = BPTU is not receiving AIS
YALM/RAI	RAI indication On = BPTU is receiving RAI Off = BPTU is not receiving RAI
LOS	Signaling Loss indication On = BPTU is not receiving T1 signals Off = BPTU is receiving T1 signals
BSY	Busy state indication On = One or more B-channels are in use. Also when BPTU does not receive far end 1.544 mbs carrier signal, BSY is on steady. Off = All B-channels are idle
PSYNC	Primary synchronization indication On = BPTU is assigned as the secondary timing PCB. Off = BPTU is not assigned as the CLK timing PCB Flashing = BPTU is extracting T1 CLK
SSYNC	Secondary synchronization indication Not mounted

Ferrite Core

Install the Ferrite core provided with the BPTU PCB, as shown in Figure 7-7 on page 7-13. This core is needed to comply with FCC requirements.

BPTU Cabling

The BPTU and RPTU PCBs use the same cabling methods. Refer to "BPTU and RPTU Cabling" on page 7-11.

RPTU Interface Unit

Circuits per PCB: *24 channels*
Interfaces with: *ISDN PRI*
Older Version(s): *none*

The RPTU provides 24 channels for ISDN PRI service. Network connection using RPTU PRI interface requires installation of a customer-provided CSU in most locations of the U.S. Refer to "CSU Requirements" on page 7-3 for CSU installation.

Switches, jumpers, and interface connectors are described in Table 7-5. The RPTU's LEDs show operation status (see Figures 7-4 and 7-5 on page 7-9 and Table 7-6).

Testing procedures (local and remote loop back) are in "Loop-back Test" on page 7-34.

RPTU Installation

Before installing a RPTU PCB into a Strata CTX system, refer to Chapter 2 – Strata CTX Configuration:

- "Worksheet 6: Strata CTX670 Cabinet Slots" on page 2-37
- "ISDN PRI Digital Line PCBs" on page 2-40 (mentioned above in slot assignments)

➤ **To install an RPTU PCB**

1. Set the jumper wire plugs JP1 and JP2 (LB) to the Off position.
2. Turn the Strata CTX system power Off.
3. Insert the RPTU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper seating of connectors.
4. After installing the RPTU, gently pull the PCB outward. If the connectors are properly seated, a slight resistance is felt.

Note For cabling information and requirements, refer to "BPTU and RPTU Cabling" on page 7-11.

Table 7-5 RPTU Switches, Jumpers, and Connectors

Switches/Jumpers/Connector	Description
SW1 (Line length adjustment switch)	Matches the RPTU impedance to the impedance of the line (length between the CSU and the RPTU). Refer to Table 7-7 on page 7-10.
SW2 (Reset switch)[1]	Resets or initializes the RPTU firmware. Press this switch to correct an out-of-service condition, or just prior to connecting to the Network PRI.
JP1 & JP2 (Loop-back jumpers)	Makes loop-back tests of the cabling between the ISDN Network switch, CSU, and RPTU.
J1 8-pin Modular Connector (RJ45)	Connects the RPTU to the CSU/network PRI ISDN line.
J2 6-pin Modular Connector (RJ11)	Connects the RPTU to a terminal or PC to monitor D-channel data.

1. If this switch on the Primary Clock source RPTU is pressed, the clock source will automatically revert to the Secondary Clock source.

Note The RPTU2 is required for QSIG networking.

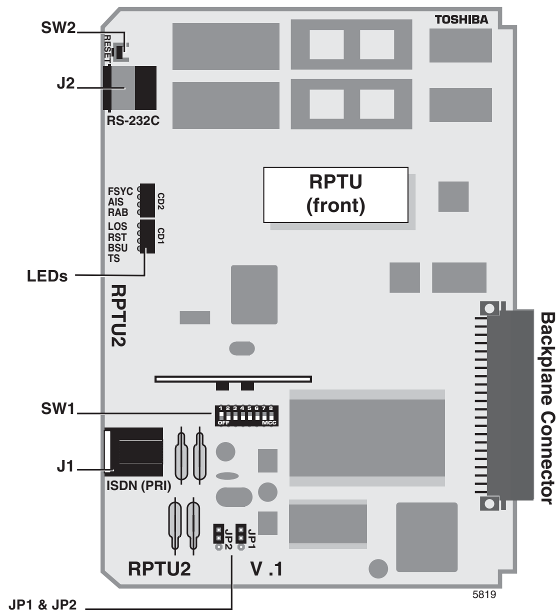


Figure 7-4 RPTU2 PCB

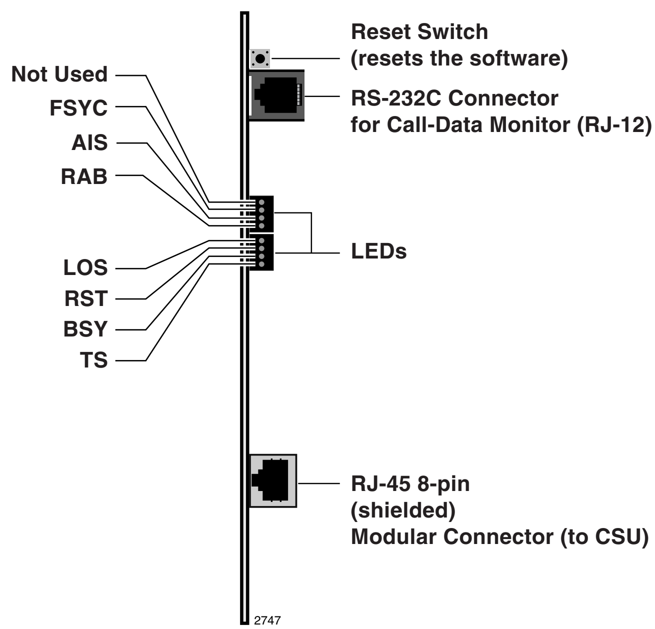


Figure 7-5 RPTU LEDs and Connectors

Table 7-6 RPTU LED Functions

LED	Functions
FSYC	Frame Synchronization On: Frame alignment is lost. Off: Frame alignment is working properly.
AIS	Alarm Indication Signal On: Receiving an alarm from the CO. Off: Circuit is working properly.
RAB	Remote Alarm On: Receiving a remote alarm from the CO. Off: Circuit is working properly.
LOS	Loss of Signal On: IC signal cannot be detected. Off: Circuit is working properly.
RST	Reset On: CPU is resetting the software. Off: Circuit is working properly.
BSY	Busy On: One or more B-channels are busy. Off: All B-channels are idle.
TS	Timing Signal On: Circuit is secondary timing source. Off: Circuit is not used for system timing. Flashing:Circuit is primary timing source.

The RPTU SW1 settings for the proper cable length are shown in Table 7-7. For cabling instructions, see BPTU and RPTU Cabling.

Table 7-7 RPTU SW1 Cable Length Settings

SW1	Short (0 - 150 ft.)	Medium (150 - 450 ft.)	Long (450 - 655 ft.)
1	On	Off	Off
2	Off	On	Off
3	Off	Off	On
4	Off	On	Off
5	Off	Off	On
6	Off	On	Off
7	Off	Off	On
8	Not Used	Not Used	Not Used

BPTU and RPTU Cabling

To meet Part 15 of FCC Rules, ISDN PRI equipment must be connected using CAT5, Shielded Twisted-Pair (STP) cabling between the CSU and the BPTU or RPTU. CAT5 STP protects against cross talk, Radio Frequency Interference (RFI), and/or Electro Magnetic Interference (EMI). STP protects ISDN signal data while being transmitted through the cable and keeps the cable itself from emitting EMI and RFI.

Important! *To avoid ground loops, connect only the BPTU or RPTU end of the shielded cable to ground. The Strata CTX grounds the CAT5 cable shield between the Strata CTX and CSU at the BPTU or RPTU RJ45 jack. You do not have to connect the CSU ground drain. The CSU ground should not be connected to the cable shield.*

Shield continuity must be maintained from the BPTU or RPTU to the CSU, particularly if using extension connecting cables. Keep the cable as short as possible between the CSU and the PRI Demarcation jack, because there is no shield between the CSU and the Demarcation jack.

Toshiba provides a cable kit (Part No. RPRI-CBL-KIT), that contains all that you need to connect the network ISDN jack to the network side of most CSUs and the equipment side of the CSU to the BPTU or RPTU PCB. Depending on the manufacturer, the CSU may use DB15 or modular jacks. If the CSU is equipped with the modular jacks, the DB15/modular adapters are not used. If this is the case, make sure the CSU modular jacks are not shielded jacks.

A detailed pinout diagram for the RJ45 network jack (USOC RJ48C or RJ48X) and the modular cords/adaptors are shown in Figure 7-6 on page 7-12 and Figure 7-8 on page 7-13.

Cable Length

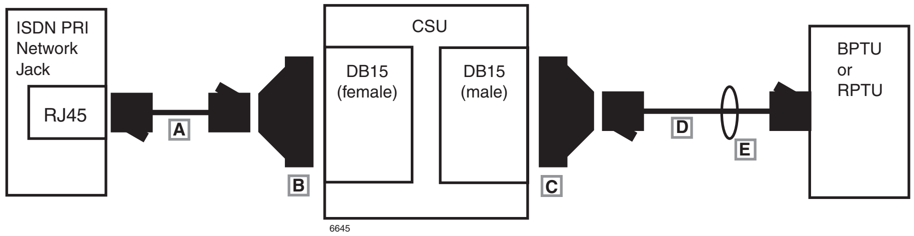
The distance between the BPTU/RPTU and CSU or the BPTU/RPTU and other Customer Premise Equipment (CPE) may vary (0~655 ft.). The BPTU or RPTU must be equalized and its impedance must match the impedance of the connecting cable.

➤ BPTU: Set the SW settings for the proper cable length (see Table 7-3 on page 7-6 and Figure 7-3 on page 7-5).

➤ RPTU: Set the SW settings for the proper cable length (see Table 7-7 on page 7-10 and Figure 7-5 on page 7-9).

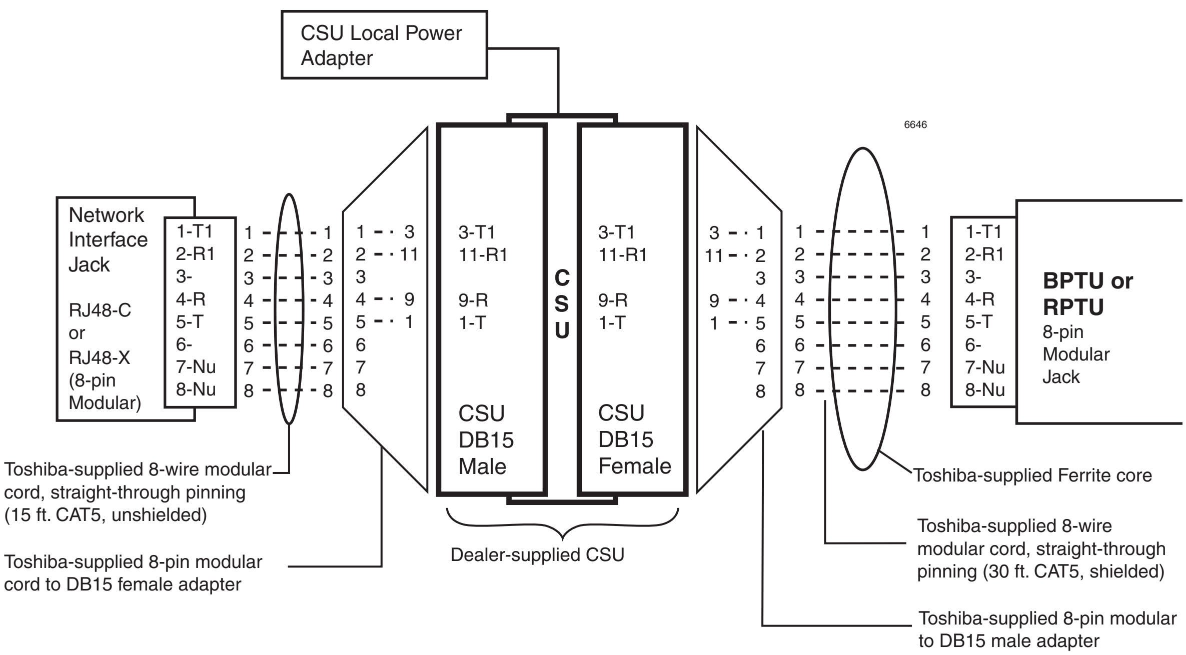
Cable Installation

Use the Toshiba RPRI cable kit to connect the BPTU or RPTU PCB to a CSU. Install the kit as shown in Figure 7-6.



Item	Description
A[1]	Fifteen feet of CAT5 unshielded cable
B	One DB15 modular adapter (CSU to network jack)
C	One DB15 modular adapter (CSU to RPTU)
D[1]	Thirty feet of CAT5 shielded cable
E	One Ferrite core

1. Cable A and D are straight-pinned data cables, not cross-pinned telephony cables.



Network Jack/BPTU or RPTU Modular Jack

Pin	Function
1	Tip – Receives from the network (NT – TE)
2	Ring – Receives from the network (NT – TE)
3	Not Used
4	Tip – Transmits to the network (TE – NT)
5	Ring – Transmits to the network (TE – NT)
6	Not Used
7	Not Used
8	Not Used

Figure 7-6 Detailed Pinouts for ISDN PRI Cabling

Ferrite Core

Install the Ferrite core provided with the RPRI cable kit as shown in Figure 7-7. This core is needed to comply with FCC requirements.

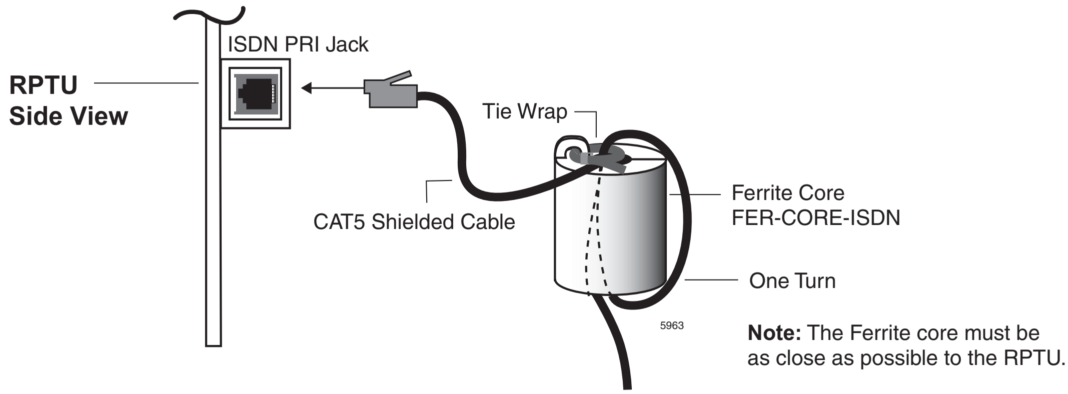


Figure 7-7 Ferrite Core Installation

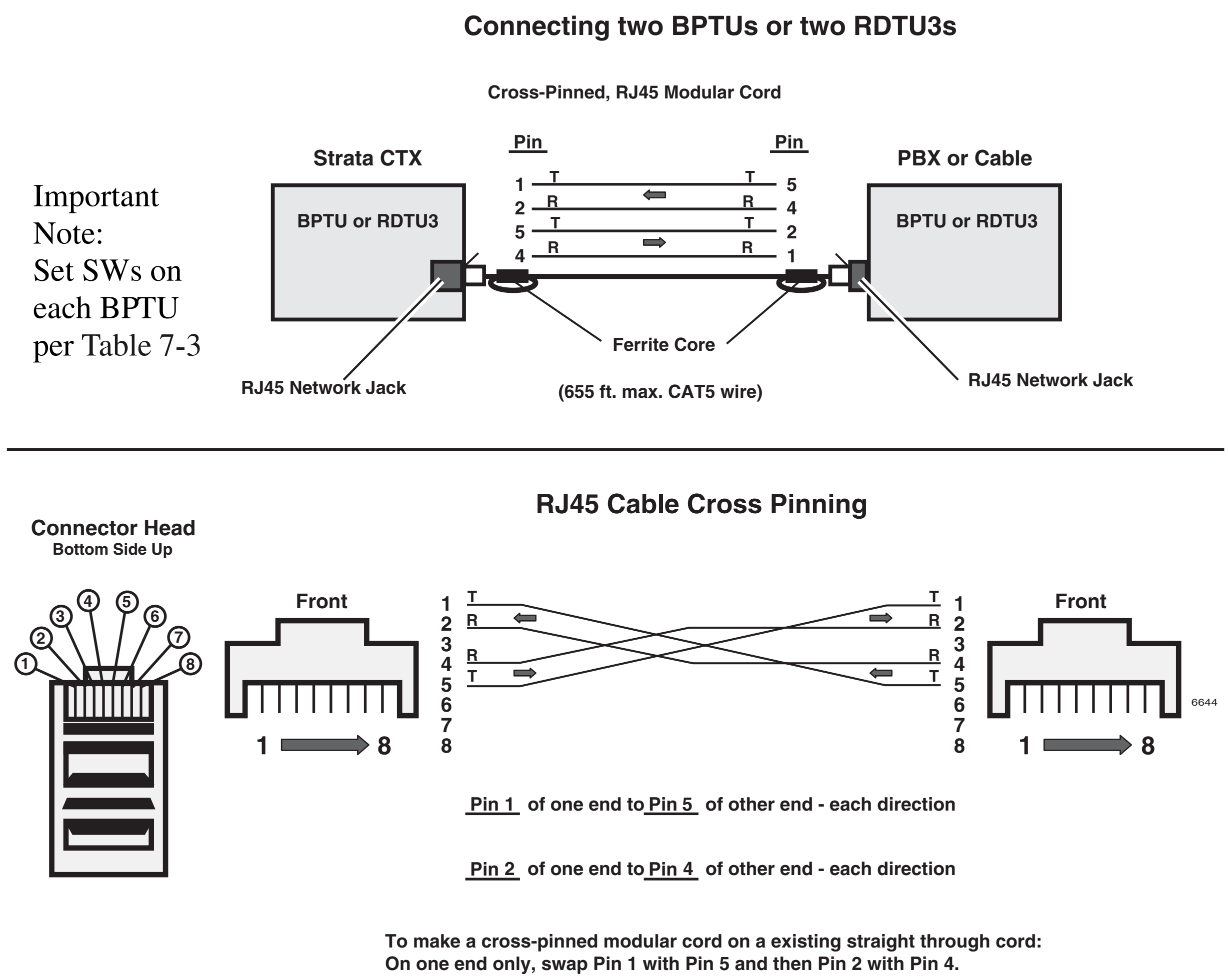


Figure 7-8 Direct Connect Two BPTU or RPTU2 PCBs for QSIG Networking

RBSU/RBSS Interface Units

Circuits per PCB: *2 circuits (2B + D each circuit)*

Interfaces with: *ISDN BRI S/T when connected to the Public Network or a BRI S-type, TE-1, or TA devices when connecting to ISDN station equipment*

Older Version(s): *none*

RBSU/RBSS switches, jumpers, and connectors are shown in Figures 7-11 and 7-12 on page 7-17 and described in Table 7-8.

LEDs on the RBSU/RBSS show a continuous status of BRI operation. Refer to Table 7-8 on page 7-17 for a list of each LED's status.

Overview

The RBSU and RBSS PCBs provide the Basic Rate Interface (BRI) circuits. The RBSU is the main plug-in PCB that plugs into the Strata CTX cabinet slots.

The RBSS is an optional PCB that plugs onto the RBSU. Each PCB provides two ISDN BRI circuits. Each BRI circuit provides 2 B-channels + 1D channel for voice/data/video applications.

An REBU PCB is a piggy-back PCB that plugs onto the RBSU and provides basic functions for RBSU/RBSS circuits so it must always be installed on the RBSU.

The RBSU circuits are four-wire S/T type circuits and connect to the Public Switched Telephone Network (PSTN) BRI lines using an Network Terminator unit (NT1); or, on the station side, they can connect to ISDN Terminal Equipment (TE) or Terminal Adapters (TA) as shown in Figure 7-9.

TE devices include any ISDN device (telephone, fax, computer) that connects directly to S/T ISDN BRI circuits. TA devices match the protocol of non-ISDN devices (telephone, fax, computer) to the protocol of S/T ISDN BRI circuits.

The TBSU and RBSU circuits can be configured as:

- BRI – TE circuits which connect to Telephone Network BRI lines using a NT1.
- BRI – NT circuits which connect to ISDN TEs or TAs. These devices must be S-type station devices.

Important! *The Strata CTX BRI circuits allocate line numbers and station ports differently. Each BRI circuit consumes two line numbers and two station port when configured as line-side or station side.*

RBSU Connection Options

The RBSU connection options (BRI line or ISDN TE-1/TA devices) are selected in customer database programming and option switches located on the RBSU.

The RBSU circuits that connect to the ISDN network side requires a dealer-supplied NTI interface box to convert the two-wire, U-interface BRI line from the telephone network to the four-wire, T-interface of the RBSU circuit. The NT1 must be UL listed (U.S.) or CSA certified (Canada). The network BRI line connection is a point-to-point connection, which means that the network BRI line can only be connected to one RBSU or TBSU circuit via the NT1 (T-reference point).

RBSS circuits connect directly to S-type TE-1 or TA ISDN devices only. They do not support BRI-TE telephone network BRI line connections.

The RBSU, and/or RBSS circuits that connect to the Strata CTX station side, (BRI-NT, S-reference point) allows direct connection of multiple ISDN (TE-1 or TA) devices. The S point of the RBSU/RBSS supports the Toshiba Strata CTX passive bus, also known as point-to-multipoint connection. The terminal-side (S-point) of the RBSU/RBSS BRI circuit can have parallel connections of up to two TE-1s or TAs maximum.

When multiple TE-1 and TA devices are installed on a single RBSU/RBSS BRI circuit, the devices must share, or contend for, that circuit's two B-channels. That is to say, a maximum of two simultaneous voice and/or data calls are allowed between both devices connected to the same BRI circuit. The contention rule for the two BRI B-channels is first come, first serve.

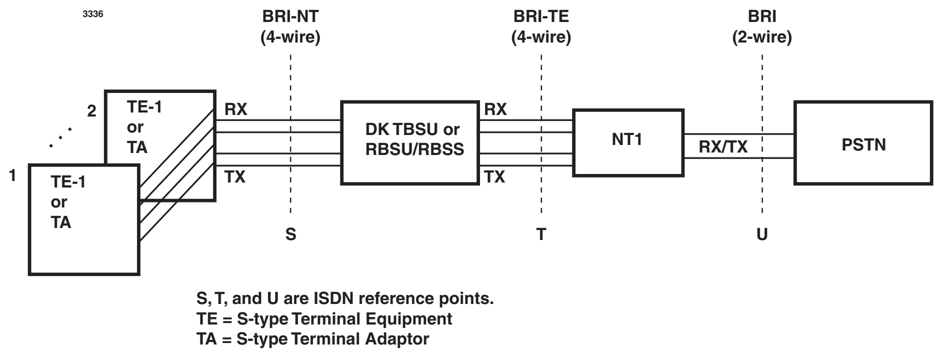


Figure 7-9 RBSU/RBSS Interfaces between the S/T Reference Points

Capacity and Cabinet Slot Information

The RBSU/RBSS can be installed in any slot except in a slot that has been left vacant to provide capacity for RDTU, BPTU or RPTU2 or RPTU as shown in Table 2-54 on page 2-39 and Table 2-55 on page 2-40. Each RBSU and/or RBSS contains two circuits and each circuit reduces the system capacity by two station ports *and* two CO lines (one port/line per B-channel). Therefore, if the RBSU PCB is installed, the station port and CO line count will increment by four ports and four lines at the RBSU cabinet slot.

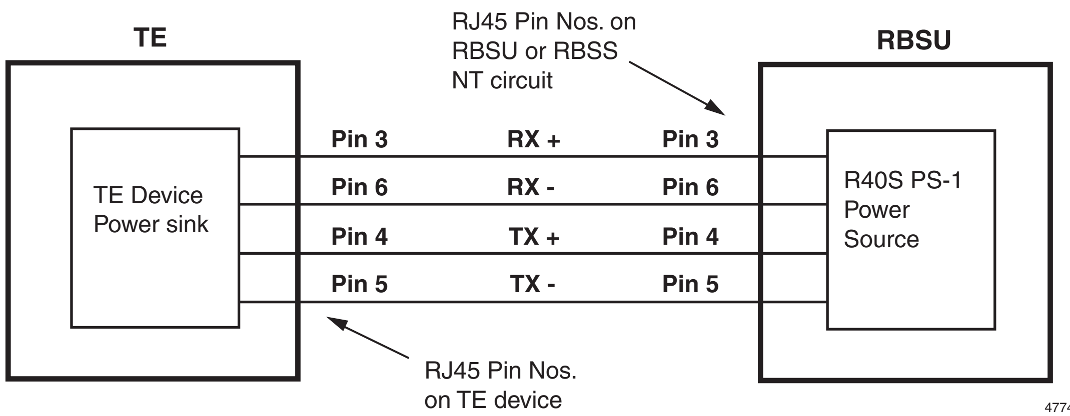
If the RBSU/RBSS is installed, the station port and CO line count will increment by eight station ports and eight lines at the RBSU/RBSS cabinet slot. RBSU and RBSS PCBs can be installed in any combination so long as the number of RBSU PCBs is the same or greater than the number of RBSS PCBs. See "ISDN BRI Digital Station PCBs" on page 2-41 and "Worksheet 3: CO Line" on page 2-25 for the maximum BRI circuits allowed.

PS-1 Backup Power Option

The RBSU provides an optional backup power supply, R40S, that will supply backup power to TE devices in the event of an AC power loss. This power backup option only applies to RBSU or RBSS circuits that are configured in the NT mode. See Figure 7-13 to install the R40S.

Also the Strata CTX system must have battery backup to allow the R40S power backup function to operate. The R40S power supply is an ISDN, PS-1 type power unit which means it supplies power to TE devices on the RBSU/RBSS transmit and receive wire pairs as shown in Figure 7-10. This power arrangement is also known as phantom power.

Each of the four circuits on RBSU/RBSS can be connected to share the R40S using option switches on the PCBs (see Table 7-8). Before using the R40S as a backup power source, make sure the TE devices do not require more power than the R40S can supply and the TE is compatible with the ISDN PS-1 power arrangement.



R40S Power Limits:
Voltage: 33.3VDC to 38.85VDC maximum
Current: 100mA maximum (25mA maximum per each RBSU/RBSS circuit)

Figure 7-10 Power Limits of the Backup Power Supply

RBSU/RBSS Installation

Step 1: Run Related Programs

➤ Run all ISDN programs related to RBSU/RBSS BRI circuits prior to installation of the PCBs. This enables the circuits to operate immediately upon insertion. ISDN BRI programs are explained in the *Strata CTX Programming Manual* under the ISDN tab.

Step 2: Set Option Switches/Jumpers

➤ Set all option switches and jumpers on the RBSU and RBSS PCBs before plugging the RBSS onto the RBSU or inserting the RBSU into the system. RBSU/RBSS switch/jumper information and locations are shown in Figures 7-11, 7-12 and Table 7-8.

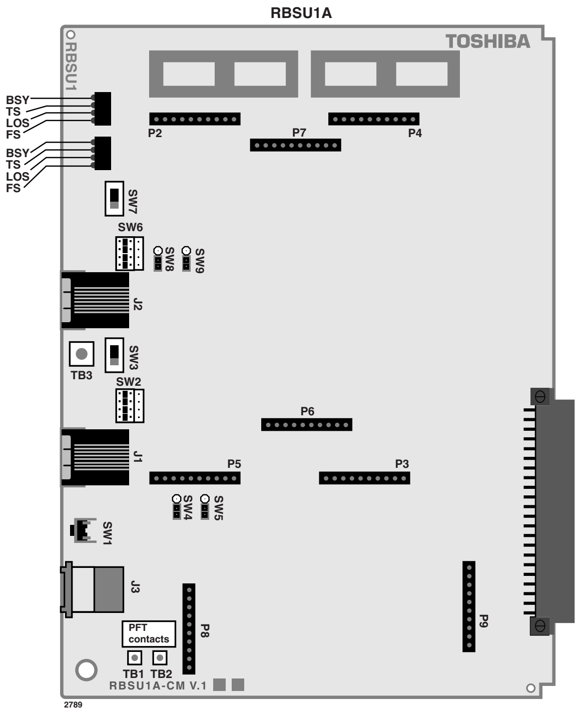


Figure 7-11 RBSU PCB

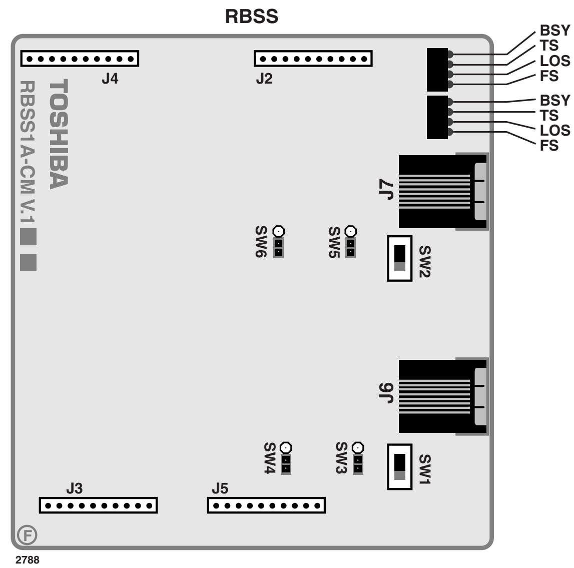


Figure 7-12 RBSS PCB

Table 7-8 RBSU/RBSS Option Switches, Jumpers, and Connectors

PCB	Circuit	Option Switch	Type	Circuit Type		Description
				TE	NT	
RBSU	All	SW 1	Push-button	N/A	N/A	Resets firmware on all circuits of RBSU/RBSS. Drops calls off the RBSU/RBSS.
	1	SW 2	Jumper	X	X	Causes the circuit to operate as TE or NT[1].
	1	SW 3	Slide	On	Off	Switches a 100-ohm resistor in/out of the circuit.
	1	SW 4, 5	Jumper	N/A	On	Switches PS-1 in/out of the circuit.
	2	SW 6	Jumper	X	X	Causes the circuit to operate as TE or NT[1].
	2	SW 7	Slide	On	Off	Switches a 100-ohm resistor in/out of the circuit.
	2	SW 8, 9	Jumper	N/A	On	Switches PS-1 in/out of the circuit.
RBSS	3 (NT only)	SW 1	Slide	On	Off	Switches a 100-ohm resistor in/out of the circuit.
	3 (NT only)	SW 3, 4	Jumper	N/A	On	Switches PS-1 in/out of the circuit.
	4 (NT only)	SW 2	Slide	On	Off	Switches a 100-ohm resistor in/out of the circuit.
	4 (NT only)	SW 5, 6	Jumper	N/A	On	Switches PS-1 in/out of the circuit.

1. Requires programming to set as TE or NT.

Step 3: Install the REBS

Note The REBS provides a basic part of the RBSU/RBSS circuit functionality; therefore, it must always be installed on the RBSU (see Figure 7-13).

1. Align the two connectors carefully while observing the “UP” arrows on the REBS.
2. Plug the REBS onto the RBSU.

Step 4: Install the RBSS

Note If one or two additional BRI-NT circuits are required, install the RBSS (see Figure 7-13).

1. Align the four connectors carefully while observing the “UP” arrows on the REBS.
2. Plug the RBSS onto the RBSU.

Step 5: Install the R40S

Note If ISDN PS-1 backup power for TE devices is required, install the R40S (optional PCB) (see Figure 7-13).

1. Align the two connectors carefully while observing the “UP” arrows on the R40S.
2. Plug the R40S onto the RBSU.

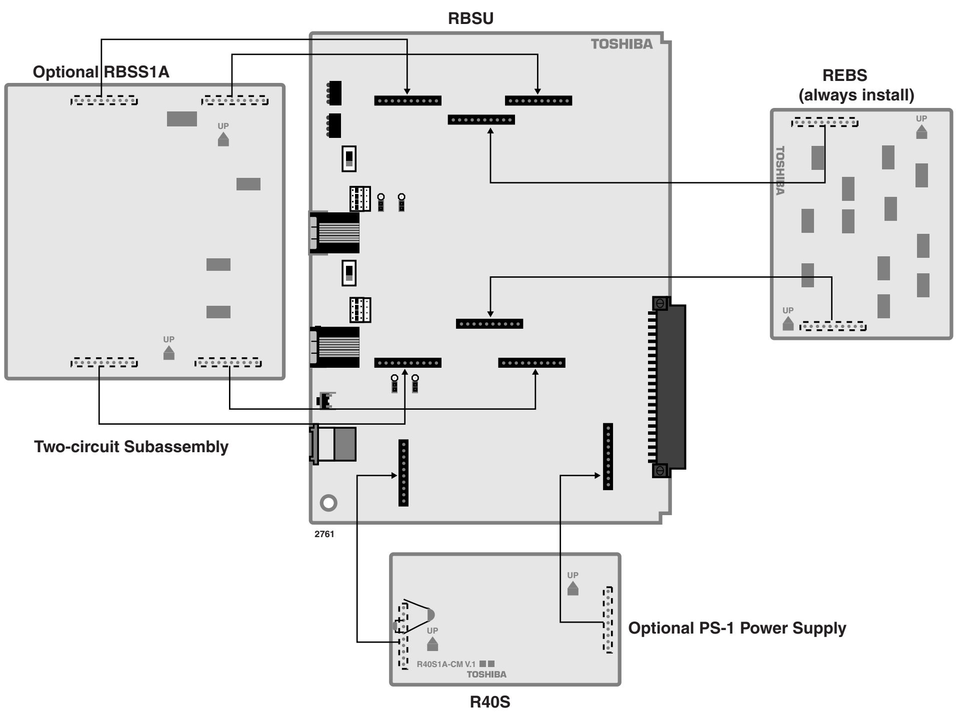


Figure 7-13 Location of RBSU Plug-on PCBs

Step 6: Install RBSU/RBSS PCBs into Cabinet

After setting the switches and jumpers and installing the plug-on PCBs as described in the preceding paragraphs, the RBSU/RBSS PCBs can be installed in the appropriate cabinet slots. Refer to RBSU/RBSS Capacity and Cabinet Slot Information on Figure 7-14. After the RBSU/RBSS is installed in the Strata CTX cabinet, the status LEDs and connecting jacks are positioned as shown in Figure 7-14.

Table 7-9 RBSU/RBSS LED Indications

LED	Indication
BSY	**Circuit Busy** On – Any B-channel is in use. Off – B-channels are idle.
TS	**Timing Source** Blinking On/Off – The RBSU is extracting the clock from the BRI line and is the Primary synchronization circuit for ISDN and T1. On – The RBSU is the secondary (backup) synchronization circuit for the ISDN and T1. Off – The RBSU is not used for ISDN or T1 synchronization.
LOS	**Loss of Signal** On – Clock timing cannot be detected from the line. Off – Normal condition.
FS	**Frame Alignment Alarm** On – Frame alignment cannot be established. Off – Frame alignment is established.

Modular Jack Pin Configurations

BRI (S/T) Circuit Jack (TE or NT Mode)

The RBSU and RBSU/RBSS BRI circuit jack is a shielded RJ45 (8-pin modular) with Transmit (Tx) and Receive (Rx) pin numbers as shown in Figure 7-14. The Tx and Rx pin numbers change when the BRI circuit is configured with RBSU and RBSU/RBSS option switches for TE or NT (Tables 7-8 and 7-14). If the R40S is installed on the RBSU, the PS-1 voltage is carried on the Tx/Rx wires with polarity. (See Table 7-10).

The position of the RBSU BRI and RBSU/RBSS circuit jacks are shown in Figures 7-14 and 7-15 respectively.

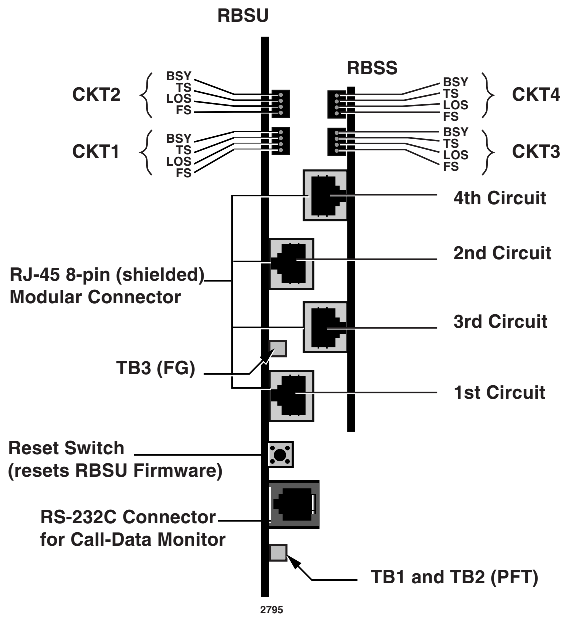
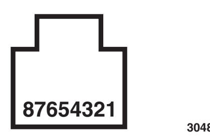


Figure 7-14 RBSU/RBSS Location of LEDs and Connector Locations

Table 7-10 RJ45 Pins in the 8-pin Modular Jack

Pin No.	TE Side	NT Side	PS1/R40S Polarity
1	N/C	N/C	N/C
2	N/C	N/C	N/C
3	Tx	Rx	+
4	Rx	Tx	+
5	Rx	Tx	-
6	Tx	Rx	-
7	N/C	N/C	N/C
8	N/C	N/C	N/C



Front View of RJ-45 Jack Cavity
Note: The RJ-45 pins are numbered as shown above.

Monitor Jack

The RBSU/RBSS monitor jack is an RJ12 (6-pin modular). This jack provides an RS-232 output that enables you to monitor the RBSU/RBSS BRI circuit D-channel, layer-2 and layer-3 data. The monitor jack pin configuration and communication parameters are the same as BPTU or RPTU and RBUU (see Figures 7-32, 7-35 and 7-36). For RBSU monitor jacks, see Figure 7-34 and Figure 7-14 on page 7-20.)

RBSU/RBSS Premise Wiring Guidelines

Power Failure Terminal Screws

TB1 and TB2 are the connecting points that interface a pair of dry contacts that can be used for power failure switching purposes (see Figure 7-14 for the locations). When the Strata CTX system has power (from AC source or batteries) there is a short circuit across TB1 and TB2. In the event of no power to the Strata CTX, there is an open circuit across TB1 and TB2. The specifications for TB1 and TB2 contacts are:

- Maximum switchable voltage: 30VDC
- Maximum switchable current: 80mA
- Short circuit resistance: Approximately 15 ohms

Grounding Terminal Screws

TB3 is a screw terminal that can be used to connect a ground wire to the RBSU PCB (see Figure 7-14 for the location). This ground enables the RBSU/RBSS to meet Electro Magnetic Compatibility (EMC) requirements. The RBSU complies with EMC requirements without grounding TB3 on the RBSU, so it is not necessary to connect a ground wire to TB3.

BRI Wire Type Recommendations

CAT3 or CAT5 wire is recommended for ISDN BRI customer-premises wiring. While the ISDN BRI signal works for some distance over almost any wire that is suitable for analog voice service, better wire enables longer runs. CAT5 provides better 100-ohm impedance matching (at little extra cost) between the RBSU/RBSS circuit and the station Terminal Equipment (TE-1).

Normally the CAT3 or CAT5 wiring does not have to be shielded when used for ISDN BRI premises wiring. However, the RJ45 jacks on the RBSU/RBSS BRI circuits are shielded and provide a ground shield in the event that shielded modular plugs and cable are used.

Note If using shielded cable and plugs, cable runs should only be grounded at the Strata CTX RBSU/RBSS, RJ45 jacks. To prevent ground loops, do not ground both ends of shielded cable runs.

RBSU/RBSS BRI Cable Jacks and Connectors

In the U.S., the standard connector for ISDN equipment is the eight-pin RJ jack. Patch cables have eight-pole plugs at both ends. The same pinout applies to both ends of an ISDN cable, which is the practice of the data world. This means that a flat untwisted cable with an RJ modular plug at both ends will have the locking tab of the plug on one end, “up;” and on the other end, “down,” as shown in Figure 7-15.

Note This is the opposite of telephony “silver satin” cables which have locking tabs on both ends facing the same direction. Telephony cables cause the pins at either end to crossover while data cables provide a straight through pin-to-pin connection between modular jacks.

A cord of up to 10 meters connects the ISDN BRI RJ45 wall jack to the desktop TE-1 or TA RJ45 jack. Bellcore recommends that all TE-1 and TA devices be attached with the same standard cord to ensure compatibility.

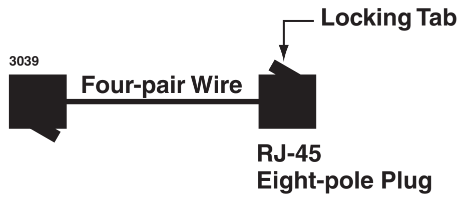


Figure 7-15 Modular ISDN Data Cable

The standard pinouts for ISDN jacks is the TIA-568A or TIA-568B jack as listed in Table 7-11. The variants A and B to the TIA specification are electrically the same, only the wire colors are different. However, you should only use one type TIA jack in a customer installation because mixing the two may cause certain wire pairs to be swapped which would result in line faults.

Table 7-11 TIA-568B (RJ45) Jack – ISDN Standard Interface Modular Connector Pinout (RBSU-NT mode

Pin	Color	Name	Function
1	Green	T2	Power 3 (not used on RBSU/RBSS)
2	Green/White	R2	Power 3 (not used on RBSU/RBSS)
3	Orange/White	R3	RX+
4	Blue/White	R1	TX+
5	Blue	T1	TX-
6	Orange	T3	RX-
7	Brown	T4	- Power 2 (not used on RBSU/RBSS)
8	Brown/White	R4	+ Power 2 (not used on RBSU/RBSS)

Notes

- Pins are numbered left to right when looking into the jack cavity with the locking tab down.
- TIA-568A swaps pair two with pair three, changing only the color of the wires on the pins. Electrical performance is the same.

Strata CTX BRI Circuit EMC Ferrite Core Requirement

To ensure that the Strata CTX BRI circuit meets the EMC requirements, it is necessary to run all wire connecting ISDN BRI circuits (TE, LT mode and NT mode) through a Ferrite core. Use Toshiba part number, FER-CORE-ISDN, to order the ferrite core. It is not shipped automatically with the BRI circuit cards, it must be grounded separately. Figure 7-16 shows how to dress the wiring through the Ferrite core.

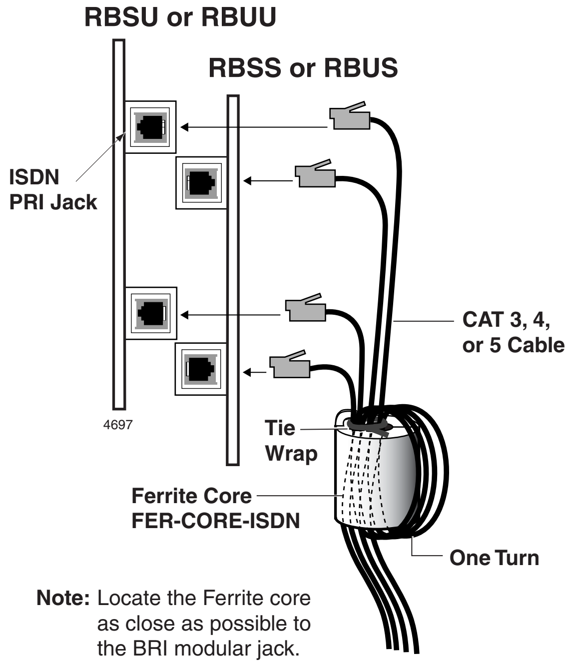


Figure 7-16 BRI Circuit Ferrite Core Installation

Connecting RBSU to Network Side (TE-Mode)

The RBSU only, not the RBSS, circuits can be connected to the network side of a BRI line. The RBSU circuits must be configured in the TE-mode (refer to option switches in Table 7-8 on page 7-17).

In the U.S., the BRI line from the ISDN service provider is a two-wire U-type BRI line. This line connects to the RBSU TE circuit via a customer-provided NT1 as shown in Figure 7-17. The NT1 is necessary to convert the network BRI, two-wire, U interface to the RBSU BRI, four-wire, T interface. The NT1 must be UL listed (U.S.) or CSA certified (Canada).

The NT1 is powered by local AC power via an AC adapter supplied with the NT1. The connection between the NT1 and the RBSU TE circuit is a point-to-point connection, so the NT1 can connect to only one RBSU BRI TE circuit.

A 100-ohm Terminating Resistor (TR) is required on each end of the point-to-point connection. The TR must be switched into the RBSU TE circuit (refer to option switches in Table 7-11 on page 7-22 and Table 7-8 on page 7-17) and into the NT1 device.

Most NT1 devices have TR option switches; if the NT1 does not have TRs, two 100-ohm TRs must be wired into the NT1 modular jack - one 100-ohm resistor across each pair (Tx and Rx). Refer to the NT1 manufacturers documentation for the maximum loop length between the NT1 and the network jack. The maximum loop length between the NT1 and the RBSU circuit is 1650 feet.

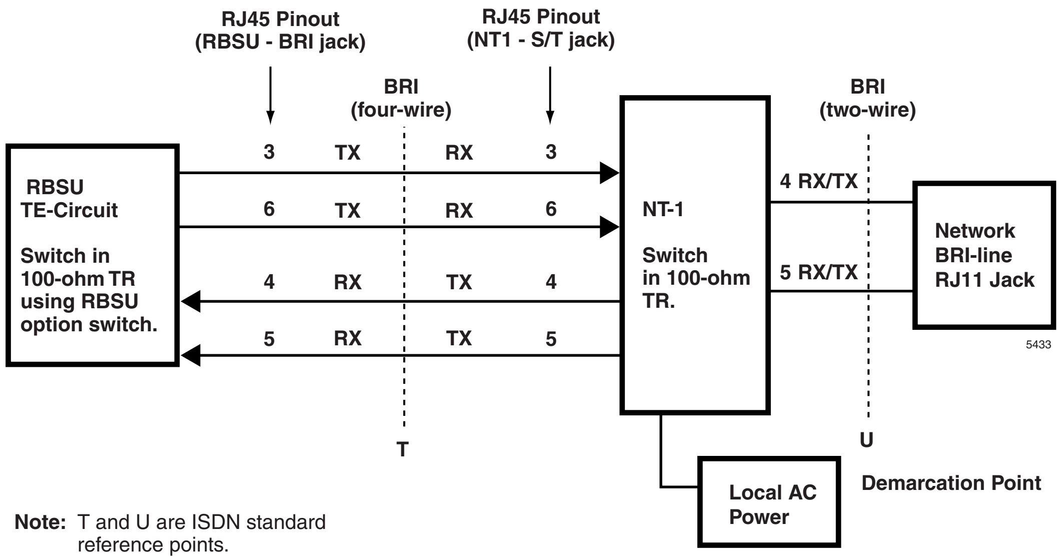


Figure 7-17 RBSU to NT1 Point-to-point Connection

Connecting RBSU/RBSS Station Devices (NT-Mode)

S-type TAs and TE-1s can be connected to the station side of TBSU, RBSU, and RBSS circuits. TA and TE devices must be powered by local AC power using AC adapter supplied with the TA or TE device. The RBSU/RBSS circuits must be configured in the NT mode when connected to TA and TE devices (refer to option switches in Table 7-8 on page 7-17 and Table 7-11 on page 7-22).

The TA enables you to connect non-ISDN voice and data devices to ISDN BRI circuits. The TA matches the protocol of existing interfaces (R-reference point) to the ISDN S/T protocol (see Figure 7-1 on page 7-2). TA devices include asynchronous circuit-switched adapters that convert RS-232 sync data (like data from a PC COM port) to B-channel 64 kbps sync.

TAs also enable you to connect standard telephones and non-ISDN fax machines to receive and make calls over ISDN circuits. TEs include any user device (telephone, fax, PC video conference board) that is designed to plug directly into the ISDN (S/T) interface without the use of a TA.

There are two types of ISDN TA and TE-1 devices: the U-type and the S/T type. Most manufacturers of ISDN station devices make both types. On the RBSU/RBSS station side, BRI-NT circuits only function with S/T type TA and TE-1 devices. You cannot connect U-type TE-1 or TA devices to the RBSU/RBSS BRI-NT circuits.

Also, connecting an NT1 to the RBSU/RBSS BRI-NT circuit to convert from S/T to U interface is not supported to enable the use of U-type TE-1 or TA device on the station side of the RBSU/ RBSS. U-type TE-1 and TA device interface is provided in the Strata CTX by the RBUU/RBUS BRI circuit only.

The RBSU/RBSS BRI-NT circuit supports the National ISDN 2 (NI2) S-Interface “passive bus.” It is called a passive bus, because it contains no logical functions. The RBSU/RBSS BRI-NT interface supports a point-to-multipoint connection on two twisted pairs. Up to two TE-1 and/or TA devices can be connected to one RBSU/RBSS, BRI-NT circuit. Using standardized wiring and modular connectors, as explained in previous paragraphs, maintains control of polarity. The pinout from the RBSU/RBSS circuit to a S-type TE-1 or TA device is shown in Figure 7-18 and Table 7-10.

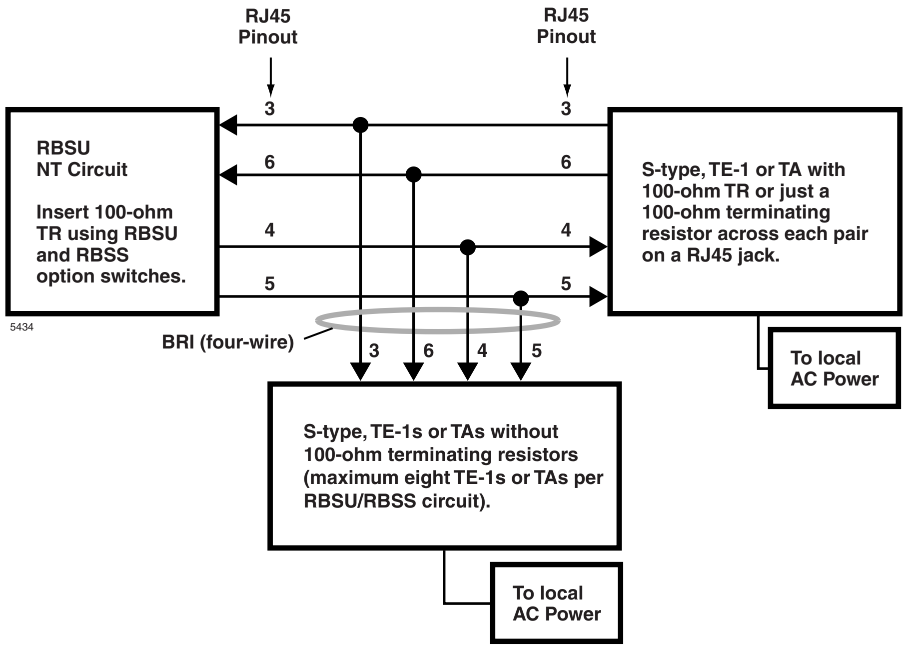


Figure 7-18 RBSU/RBSS NT Circuit Pinout on Passive Bus

As a parallel bus, the RBSU/RBSS BRI-NT passive bus will accept TE-1 and TA devices scattered on the bus; however, the locations of the TE and TA devices on the S bus is limited by timing considerations. Specifically, the round trip propagation delay of a signal from the RBSU/RBSS circuit to one device must be within four microseconds of the delay from the other device on the bus. That is to say, layer-1 frames from the RBSU/RBSS must be received within a two microsecond window. This says nothing about how large the delay can be. In fact, it can be much larger, as long as the differences remain small.

To control electrical characteristics, a 100-ohm terminating resistor (TR) is required at both ends of the passive bus. One resistor should be across the Tx pair and one across the Rx pair at either end of the passive bus. Branch-type passive bus configurations, shown in Figures 7-19~7-22, may only require a TR on the RBSU/RBSS NT circuit side and not on the TE or TA device side of the bus.

The RBSU and RBSS circuits provide an option switch that allows the 100-ohm TR to be switched into the circuit on the Strata CTX side of the bus (see Table 7-8 on page 7-17 and Table 7-11 on page 7-22). Most TE-1 and TA devices also provide option switches to connect 100-ohm terminating resistors as shown in Figure 7-17.

If the TE or TA devices do not provide TRs, they may be permanently wired in place on a RJ45 jack at the far end of the bus. Only one terminating resistor on each pair should be on the far (TE) end of the passive bus - do not switch in TRs on more than one TE-1 or TA device on the passive bus.

Important! *The correct placement of TRs on the Passive Bus is critical to ISDN BRI circuit operation (see the following RBSU/RBSS Passive Bus configurations section).*

RBSU/RBSS Passive Bus Configurations

The placement of S-type TE and TA devices on the BRI S-passive bus is critical for good RBSU/RBSS BRI circuit performance. Figures 7-19~7-22 show four passive bus architectures that are known to work. In all installations, follow the guidelines of any of these passive-bus models using the wire, cables, and jacks described in the previous paragraphs.

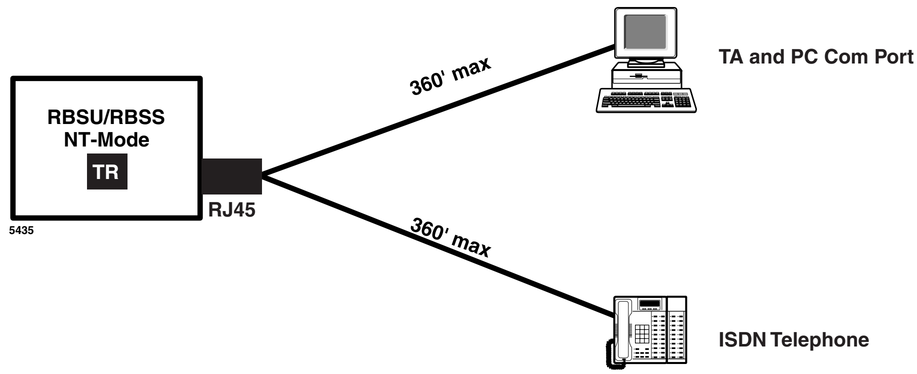


Figure 7-19 Simplified Short-branched Passive Bus

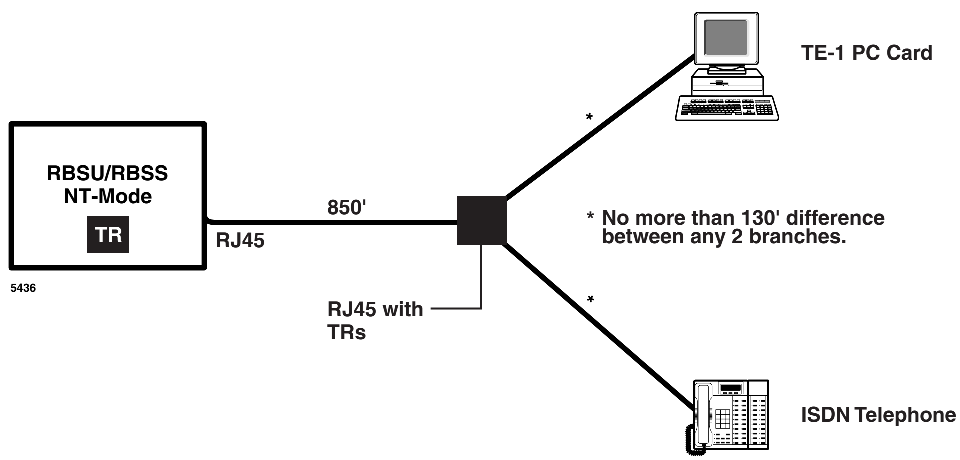


Figure 7-20 Branched Passive Bus

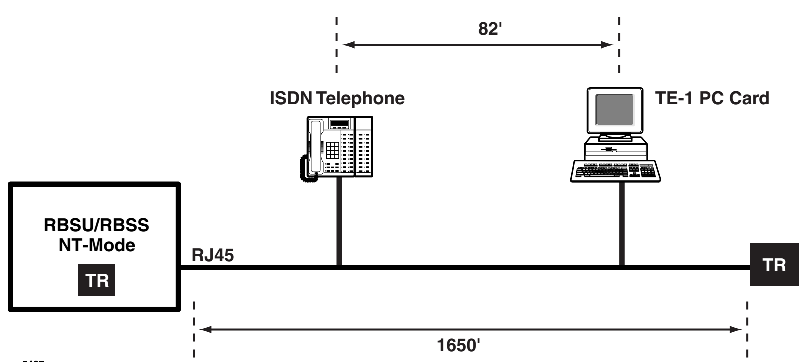


Figure 7-21 Extended Passive Bus

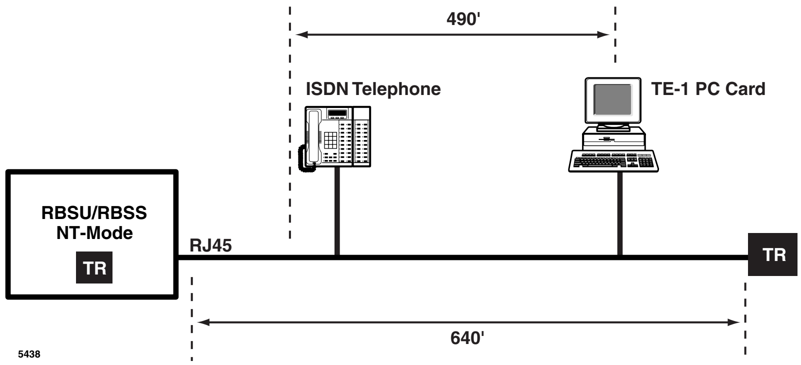


Figure 7-22 Short Passive Bus

RBUU/RBUS Interface Unit

Circuits per PCB: *2 circuits (2B + D each circuit)*

Interfaces with: *ISDN BRI U when connected to the Public Network or a BRI U-type TE-1 or TA devices when connecting to ISDN station equipment*

Older Version(s): *none*

The Strata CTX RBUU/RBUS interface unit (Figures 7-23 and 7-24) supports ISDN BRI U-type TE1 or TA devices.

LEDs on the RBUU/RBUS show a continuous status of operation. Refer to Table 7-12 for a list of each LED’s status.

Figure 7-25 shows the location of the LEDs and connectors.

RBUU Installation

Before you can begin installation of the RBUU, you may have to install the subassemblies.

➤ **To install the subassemblies (RBUS)**

➤ Place the RBUS card (component side facing down) onto the RBUU connectors. Apply firm, even pressure to ensure proper seating of the connectors. The RBUS card should have been installed at the factory.

➤ **To install an RBUU PCB**

1. Insert the RBUU (component side facing right) into the appropriate expansion unit slot and apply firm, even pressure to ensure proper seating of connectors.
2. After installing the RBUU, gently pull the PCB outward. If the connectors are properly seated, a slight resistance is felt.

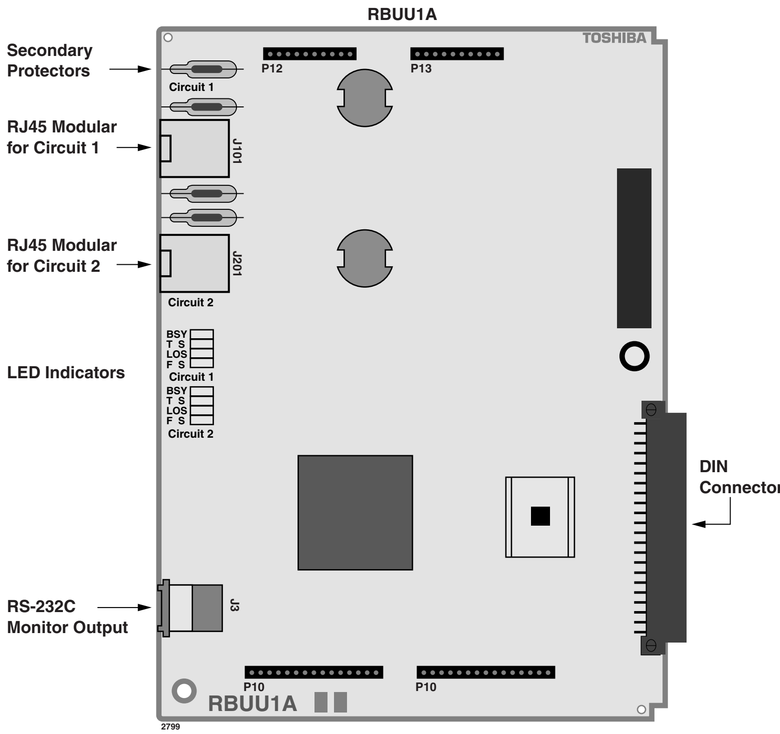


Figure 7-23 RBUU PCB

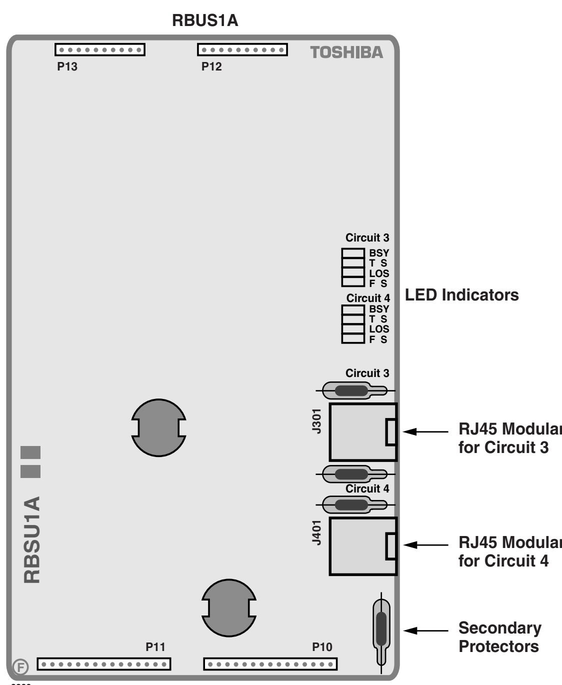


Figure 7-24 RBUS Subassembly

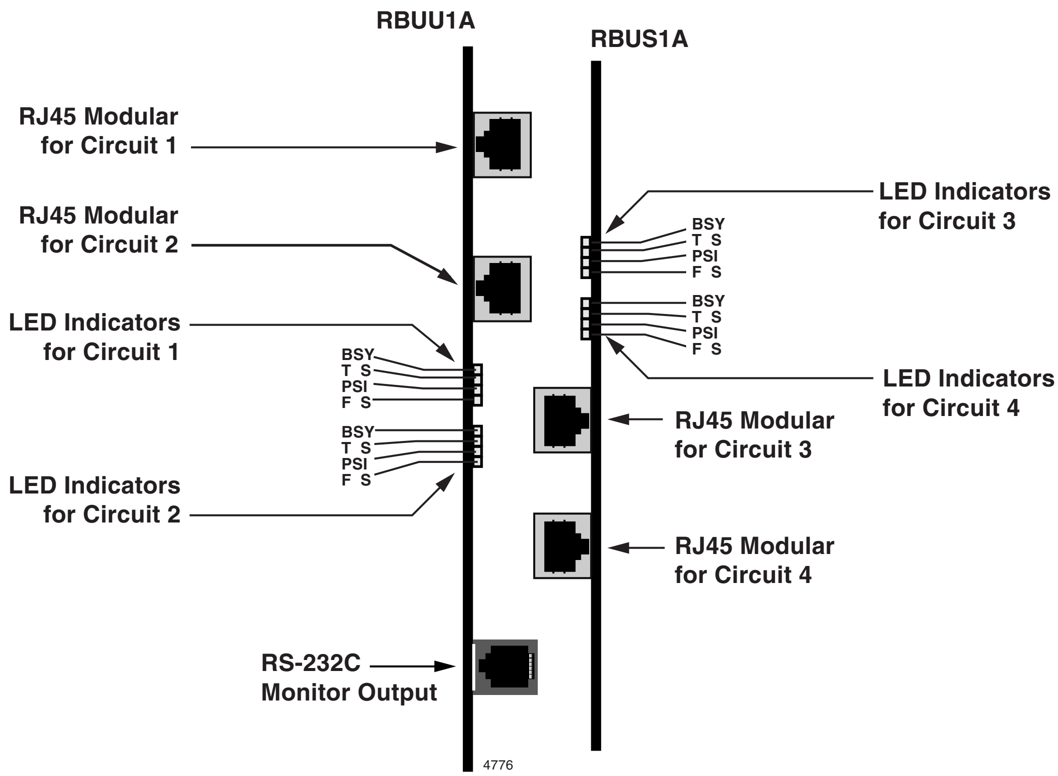


Figure 7-25 Location of LEDs and Connectors (RBUU/RBUS)

Table 7-12 RBUU/RBUS LED Indications

LED	Definition	LED Off	LED On	LED Blinking
BSY	Busy	Port is in idle.	Port is busy.	Port is in test mode.
TS	Time Synchronization	Not CLK extraction port.	Secondary CLK extraction port.	Extracting CLK port.
PSI[1]	Port Status Indicator	Port is in LT mode.	Port is in NT mode.	AIB is received by this port.
FS	Frame Synchronization	Frame alignment is established.	Frame Alignment error.	Port is trying to establish frame alignment.

1. PSI is labeled LOS on Beta PCBs

RBUU/RBUS Wiring Guidelines

- Strata CTX BRI-U interface circuits can be configured to connect to an ISDN line circuit (NT mode, line-side) or to ISDN U-type terminal equipment TE1 or terminal adapters TA (LT mode, station side).
- Install the Toshiba-supplied Ferrite core on each ISDN circuit card per Figure 7-16 on page 7-23. The Ferrite core is not supplied with the ISDN circuit cards must be ordered separately.
- For more information regarding the Strata CTX BRI-U interface, see "PRI and BRI Overview" at the beginning of this chapter.

Line-side cabling

- The ISDN BRI U-interface circuits are two-wire on the PSTN line-side.
- The wiring from the demarc to the Strata CTX BRI circuit should be made with CAT3~CAT5 twisted pair wire.
- The pinout of the Strata CTX BRI-U circuit jack is shown below.

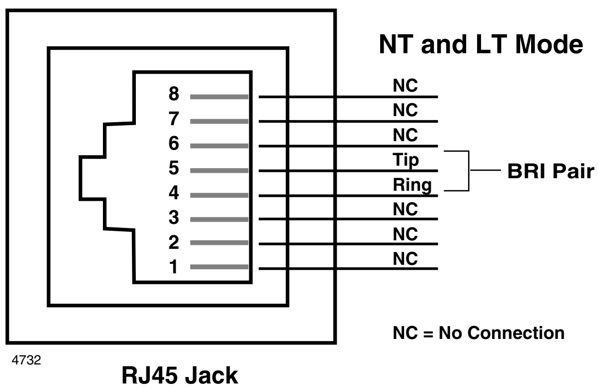


Figure 7-26 Strata CTX BRI-U RJ45 Circuit Jack Printout

- The maximum distance between the PSTN BRI interface circuit and the Strata CTX ISDN BRI U line-side circuit (NT) is 18 kft. The Telco with the use of a repeater or fiber optic cable may extend this distance.
- The U interface pair should go directly from the demarc jack to the Strata CTX interface PCB with no bridge taps to different locations or should not have loading coils installed.
- BRI line-side cables should not be shielded.
- Each line-side BRI circuit requires a ferrite core as shown in Figure 7-16 on page 7-23.
- In the USA, most BRI-U Demarc jacks are RJ11, but they may be RJ45 eight-wire jacks. In Canada the BRI-U Demarc jack is usually RJ45.
- Polarity of the U interface pair is not critical.

- The ISDN BRI-U wire pair is usually on the center pair of the Demarc jack, pins 3 and 4 on RJ11 and pins 4 and 5 on RJ45. Demarc coding is shown in Tables 7-13, 7-14 and 7-15. Typical demarc jack wiring is shown in Figures 7-27 and 7-28:

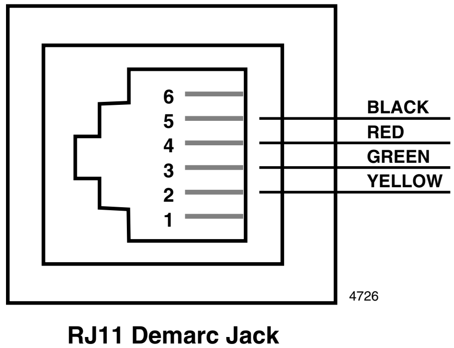


Figure 7-27 Six-pin Modular Plug (RJ11)

Table 7-13 Quad Cable with RJ11 Demarc Coding

Conductor	Color	Pin	Use
Pair 1	Red	3	Line 1
	Green	4	Line 1
Pair 2	Yellow	5	Line 2/Power
	Black	2	Line 2/Power

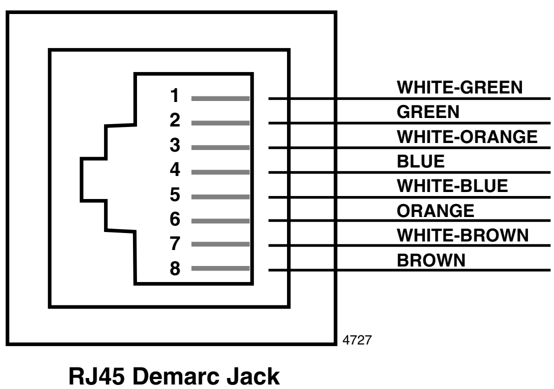


Figure 7-28 Eight-pin Modular Plug (RJ45)

Table 7-14 Four-Pair with RJ45 Demarc Jack Coding

Conductor	Color	T56A Pin	T56B Pin	Use
Pair 1	White-Blue	5	5	Line 1
	Blue	4	4	Line 1
Pair 2	White-Orange	3	1	Line 2
	Orange	6	2	Line 2
Pair3	White-Green	1	3	PS3 plus power
	Green	2	6	PS3 minus power
Pair 4	White-Brown	7	7	PS2 plus power
	Brown	8	8	PS2 minus power

Table 7-15 Three-Pair with RJ11 Demarc Coding

Conductor	Color	Pin	Use
Pair 1	White-Blue	4	Line 1
	Blue	3	Line 1
Pair 2	White-Orange	2	Line 2
	Orange	5	Line 2
Pair3	White-Green	1	Line 3
	Green	6	Line 3

Notes

- PS2 and PS3 are not used with the Strata CTX BRI-U interface PCBs.
- Check with the BRI circuit supplier to determine the pin out of the demarc jacks because some jacks may be wired with two or three BRI-U line circuits each jack.

Station-Side Cabling

- The ISDN BRI U-interface circuits are two-wire on the Strata CTX station-side.
- The maximum distance between the Strata CTX ISDN BRI-U, station-side circuit (LT) and the U-type Terminal Equipment or Terminal Adapter is 18kft.
- The house wiring from the Strata CTX BRI circuit to the wall jack should be made with CAT3~ CAT5 twisted pair wire.
- Each station-side BRI circuit requires a ferrite core as shown in Figure 7-16 on page 7-23.
- The flat satin telephone cord that connects from the wall jacks to ISDN terminal equipment should be no longer than 33 feet.
- BRI station-side cables should not be shielded.
- Polarity of the U interface pair is not critical.
- The U interface pair should go directly from the Strata CTX interface PCB to the U-type TE1 or TA with no bridge taps or loading coils to different locations.
- The pin-out of the RBUU/RBUS BRI jack is shown in Figure 7-25:

Call Monitor Jack Cabling

The pin-out for the BRI-U interface call monitor jack is provided in Figure 7-32 of this chapter.

ISDN Testing and Troubleshooting

BRI-U, LT Interface Terminal Loop Back Test

The Strata CTX provides a built-in loop back test to check the U-type, lSDN terminal connected to the RBUU or RBUS circuit. The Strata CTX performs the 2B+D loop test using the eoc ISDN, layer 1 function. This tests the U-terminal and the wire connection from the Strata CTX to the BRI device; it does not check the Strata CTX PCM highway or RBUU/RBUS functionality.

1. Connect the U-terminal device to the Strata CTX BRI, RJ45 circuit jack (see Figure 7-29).
2. Connect the Strata CTX TTY port (PIOU, RSIU, TSIU, etc.) to the COM port of a PC running a communications application such as ProComm or Hyper Terminal, etc.
3. Setup the com-port parameters for 7-bits, even parity, 1-stop bit and the appropriate speed.

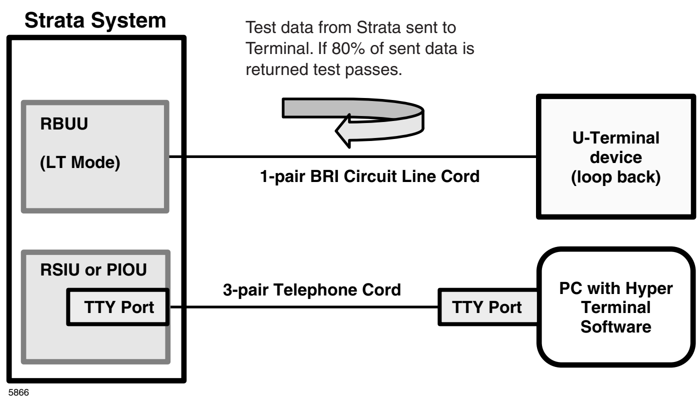


Figure 7-29 Strata CTX TTY Port BRI Connection to PC

4. Press the Enter key on the PC keyboard. The Strata CTX responds with **`CODE.`**

Note Make all entries from the PC keyboard in Capital letters.

5. At the **`CODE`** prompt, type the Strata CTX, four-digit code from the PC keyboard. The Strata CTX responds with **`MODE`**
6. At the MODE prompt, type **`TEST`** and press **`Enter`** from the PC keyboard. The Strata CTX responds with **`T.`**
7. At the T prompt, type **`LBUU ss m`** and press **`Enter`** from the PC keyboard. Where ss = BRI PCB slot number and m=BRI circuit number (1-4).

Notes

- The U-terminal must be idle, and remain idle, during the loop back test.
- The Strata CTX sends 4 octets of data to the U-terminal during the loop back test: 0X00, 0XFF, 0XB2, and 0X4D. These octets are sent to the B1, B2, and D channels 50 times. If the Strata CTX receives 80% of the sent data back, it assumes the test to pass. (i.e., the U-terminal and wiring is good.)

If the Strata CTX responds with:

```
## BUU LOOP BACK TEST ##
SLOT=ss CIRCUIT=m B1:OK B2:OK D:OK
```

The above response indicates the test was passed and that the B1, B2 and D channels and the wire connections for the tested device are operating properly.

If the Strata CTX responds with:

`TEST FAIL`

The test failure could be caused by:

- U-terminal is in busy state when the test was started.
- U-terminal is in TQ/ACB/ACD mode when the test was started
- The Strata CTX BRI PCB slot or circuit number was not entered correctly.
- U-terminal can not support loop back testing U-terminal, BRI PCB, or wiring is defective.

If the Strata CTX responds with:

`TEST EXIT`

Test exit could be caused by:

- The Strata CTX processor did not get test results from the BRI circuit within five seconds from start of the test.
- U-terminal or BRI circuit was unplugged during the test.
- User made the exit request during testing

Loop-back Test

The BPTU and RPTU have loop-back test jumpers that enable physical connections (cables/jacks/plugs) between the PCB, CSU, and the network PRI line to be tested (see Figure 7-30). The tests check that the CSU receives and transmits the PRI signal properly in both directions. The test signals, generated by the Network PRI provider, pass through the CSU and loop around the BPTU or RPTU. The BPTU or RPTU sends the received test signal back through the CSU to the Network and the Network detector checks for a valid signal.

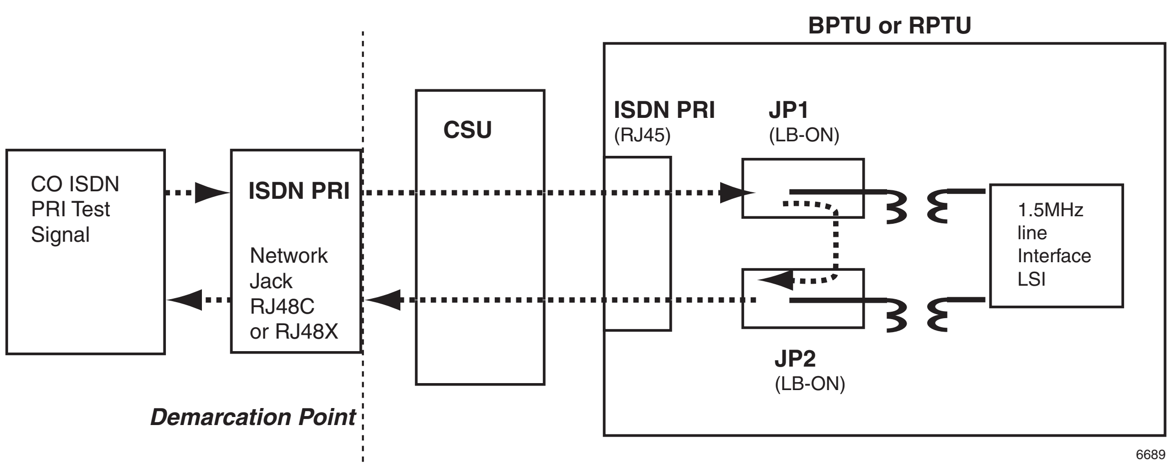


Figure 7-30 Loop-back Test

Loop-back Test

1. Remove the PRI modular cord from the RPTU RJ45 jack and remove the RPTU from its card slot.
2. Place the JP1 and JP2 jumpers to the LB-On position. Install the RPTU with the Strata CTX power Off and the PRI modular disconnected from the RPTU RJ45 jack.
3. Turn the Strata CTX power On and connect the PRI modular cord to RPTU RJ45.
4. After the PRI line and RPTU are synchronized, have the CO generate the loop-back test sign (all “1s” or “0s”).

CAUTION! **Do not have the CO do a QRS loop-back test, because the test signal may cause the Strata CTX to drop all calls and/or stop operating.**

---

5. If the loop-back test fails, perform tests to isolate the problem with an ISDN test set, such as the Sunbird, ISDN, or Trend DUET. In this case, the network PRI line is disconnected and the test set is connected to the CSU network input jack. For testing details, refer to the ISDN test set operating procedures.

Timing and Synchronization

The Digital Network is connected by timing clocks that synchronize the network and have various degrees of precision (stratum levels). There are four stratum levels – 1 is the highest and 4 is the lowest. They are associated with the following sources:

- **Stratum – 1**: Public Telephone Network clock
- **Stratum – 2**: #4 ESS Toll Switches
- **Stratum – 3**: #5 ESS Central Offices
- **Stratum – 4**: Digital PBXs

In the Strata CTX, one PRI, BRI, or T1 PCB can be programmed to extract the Stratum clock signal. It uses the signal as the Strata CTX system Primary clock reference. The clock provider should be a reliable source, such as a Telco or common carrier (AT&T). All other PRI, BRI, or T1 lines connected to the Strata CTX will be synchronized to the same clock provider. If the PRI, BRI, or T1 are not synchronized to the same clock provider, the Strata CTX could experience “slip” problems.

The timing or synchronization program determines how the Strata CTX digital voice or data transmission path is synchronized with the far-end digital path. For proper PRI, BRI, and T1 operation, the equipment at each end of the line must be synchronized.

The Strata CTX processor time switch is synchronized as the slave to the PRI, BRI, or T1 line (Line 1 in Figure 7-31).

If a malfunction occurs and Primary reference synchronization is lost, the Strata CTX automatically switches modes and synchronizes to the Secondary reference, provided that there is another PRI, BRI, or T1 installed in the Strata CTX system.

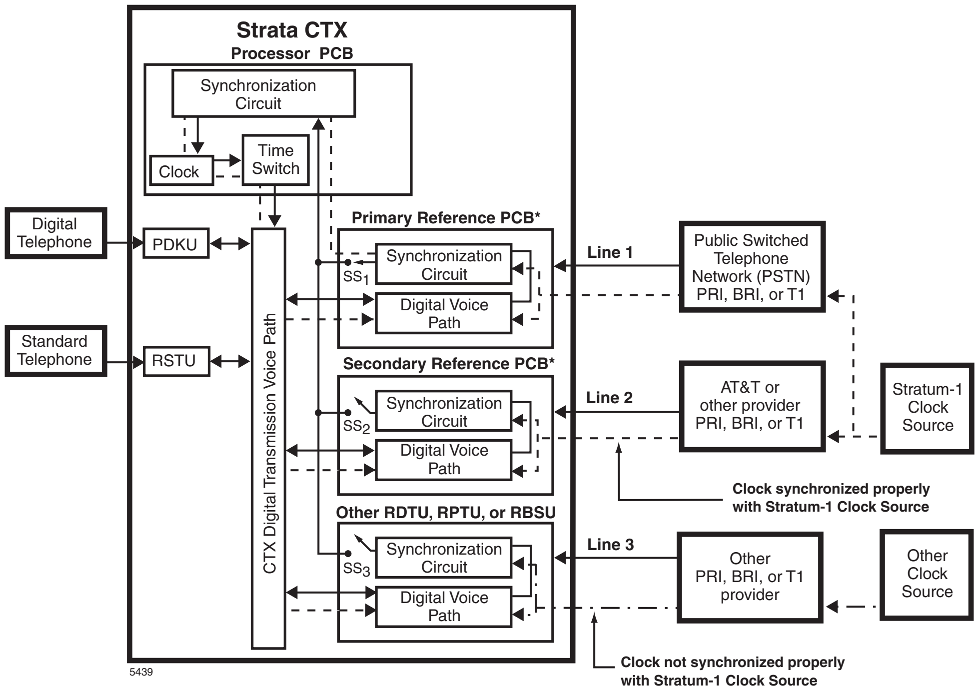


Figure 7-31 Primary and Secondary References

Figure 7-31 shows the Primary reference PCB. The clock signal from Line 1 passes through the PCB Software Switch (SS_1) and the synchronization circuit of the RCTU PCB. The RCTU clock passes the clock source through the time switch and synchronizes the Strata CTX digital transmission voice or data path.

The Secondary reference is activated if the Primary reference fails. The Strata CTX automatically *switches over* to the Secondary reference PCB by opening its synchronization circuit (SS_1) and closing the synchronization circuit (SS_2). When this occurs, the digital voice or data path of the Strata CTX is synchronized to the Line 2 clock source.

If the path is not synchronized to the Stratum – 1 clock source, calls connected through that path experience “slipping” or “jitter” in the digital voice or data path (channels). Figure 14-7 shows an unsynchronized signal from Line 3. The unsynchronized signal produces a clicking or popping sound that is heard by the people connected through this path or causes data errors on data transmissions.

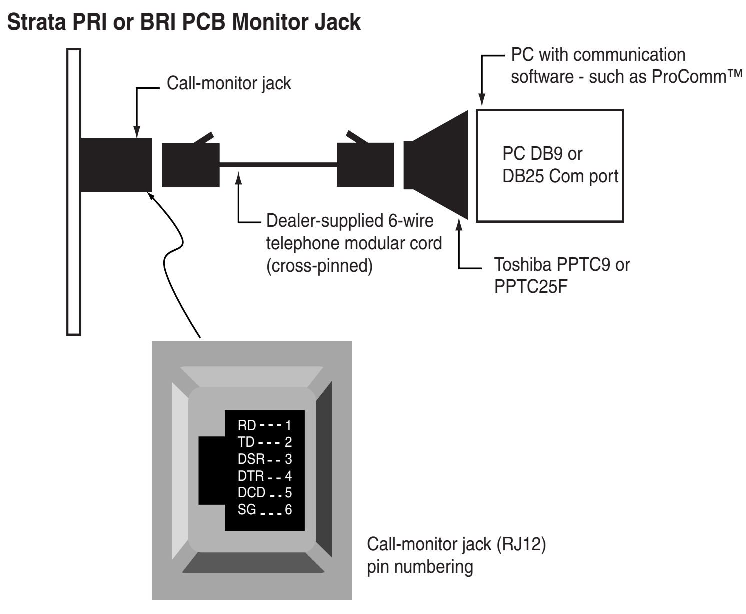
PRI/BRI Call Monitoring

The Strata CTX ISDN circuit cards provide an RS-232 monitor function that enables you to monitor the ISDN D-channel call progress layer two and three messages (setup, connect, and release). This data can be monitored live, saved to a file, and/or printed using a PC with communication software.

The hardware connections and communication parameters for the ISDN monitor port are shown in Figure 7-32. Once this connection is setup and established, call monitoring data continues to be sent (on the fly) as PRI and BRI calls are originated or received.

Two sample printouts from the RPTU monitor are provided. Figure 7-32 shows typical ISDN PRI start-up and synchronization sequences that occur at connection and power on. Figure 7-33 shows typical ISDN PRI outgoing call setup and release sequences. BRI monitor data is similar to PRI monitor data.

The communication parameters for all call-monitor jacks are 9600 bps, 7, 1, even.



Note The RPTU, RBSU and RBUU ISDN interface PCBs each have a call-monitor jack. The pin numbering and communication parameters are the same for each call-monitor jack. The call-monitor jack on each PCB provides data only for the circuits of the PCB on which it appears.

Figure 7-32 Call-monitor Jack for the RPTU, RBSU, and RBUU

Call Monitor Output for ISDN

See the following figures for examples of Call Monitor Output printouts.

```
/*-------------------------*/
  Copyright(C) 1997
  TOSHIBA Corporation
  All rights reserved
  RPTU Ver.1G
  [Reset]
/*-------------------------*/
<U1>00;00 016 Act.       (F1)

/*-------------------------*/
  Copyright(C) 1997
  TOSHIBA Corporation
  All rights reserved
  RPTU Ver.1G
  [Reset]
/*-------------------------*/
<U1>00;00 016 Act.       (F1)
<U1>00;09 634 LOS        (F3)
<U1>00;12 109 Act.       (F1)

/*-------------------------*/
  Copyright(C) 1997
  TOSHIBA Corporation
  All rights reserved
  RPTU Ver.1G
  [Reset]
/*-------------------------*/
<U1>00;00 017 Act.       (F1)
<U1>00;06 619 Tx :[SAPI]00 C [TEI]000 [FRAME]SABME P
<U1>00;06 630  Rx:[SAPI]00 R [TEI]000 [FRAME]UA    F
<U1>00;07 236  Rx:[SAPI]00 C [TEI]000 [FRAME]SABME P
<U1>00;07 245 Tx :[SAPI]00 R [TEI]000 [FRAME]UA    F
<U1>00;11 754 LOS        (F3)
<U1>00;14 228 Act.       (F1)
<U1>00;14 415 Tx :[SAPI]00 C [TEI]000 [FRAME]SABME P
<U1>00;14 427  Rx:[SAPI]00 R [TEI]000 [FRAME]UA    F
<U1>00;14 753 Tx :[SAPI]00 C [TEI]000 [FRAME]SABME P
<U1>00;14 765  Rx:[SAPI]00 R [TEI]000 [FRAME]UA    F
<U1>00;24 275 Tx :[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]000 [N(R)]000
              PD = Q.931(08)
              CR = 02 0002
              MT = SETUP(05)
              04 03 80 90 A2 18 03 A9 83 97 70 08 C1 35 38 33  ..........p..583
              33 30 30 31                                      3001
<U1>00;24 292  Rx:[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]001
<U1>00;28 315 Tx :[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]001 [N(R)]000
              PD = Q.931(08)
              CR = 02 0002
              MT = SETUP(05)
              04 03 80 90 A2 18 03 A9 83 97 70 08 C1 35 38 33  ..........p..583
              33 30 30 31                                      3001
<U1>00;28 333  Rx:[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]002
<U1>00;43 812  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]000 [N(R)]002
              PD = Q.931(08)
              CR = 02 8002
              MT = CONN(07)
```

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Figure 7-33 PRI Start-up and Synchronization Sequences

```
<U1>01;14 446  Rx:[SAPI]00 C [TEI]000 [FRAME]RR    P [N(R)]004
 <U1>01;14 449 Tx :[SAPI]00 C [TEI]000 [FRAME]RR    P [N(R)]002
 <U1>01;14 456 Tx :[SAPI]00 R [TEI]000 [FRAME]RR    F [N(R)]002
 <U1>01;14 460  Rx:[SAPI]00 R [TEI]000 [FRAME]RR    F [N(R)]004
 <U1>01;19 450 Tx :[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]004 [N(R)]002
               PD = Q.931(08)
               CR = 02 0003
               MT = SETUP(05)
               04 03 80 90 A2 18 03 A9 83 97 70 08 C1 35 38 33  ..........p..583
               33 30 30 31                                      3001
 <U1>01;19 466  Rx:[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]005
 <U1>01;19 878  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]002 [N(R)]005
               PD = Q.931(08)
               CR = 02 8003
               MT = CALL PROC(02)
               18 03 A9 83 97                                   .....
 <U1>01;19 888 Tx :[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]003
 <U1>01;19 924  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]003 [N(R)]005
               PD = Q.931(08)
               CR = 02 8003
               MT = ALERT(01)
               18 03 A9 83 97                                   .....
 <U1>01;19 932 Tx :[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]004
 <U1>01;25 464  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]004 [N(R)]005
               PD = Q.931(08)
               CR = 02 8003
               MT = CONN(07)
               18 03 A9 83 97                                   .....
 <U1>01;25 476 Tx :[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]005
 <U1>01;25 785 Tx :[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]005 [N(R)]005
               PD = Q.931(08)
               CR = 02 0003
               MT = CONN ACK(0F)
 <U1>01;25 799  Rx:[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]006
 <U1>01;46 127  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]005 [N(R)]006
               PD = Q.931(08)
               CR = 02 8003
               MT = DISC(45)
               08 02 80 90                                      ....
 <U1>01;46 138 Tx :[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]006
 <U1>01;46 449 Tx :[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]006 [N(R)]006
               PD = Q.931(08)
               CR = 02 0003
               MT = REL(4D)
               08 02 80 90                                      ....
 <U1>01;46 464  Rx:[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]007
 <U1>01;46 784  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]006 [N(R)]007
               PD = Q.931(08)
               CR = 02 8003
               MT = REL COMP(5A)
               08 02 80 90                                      ....
 <U1>01;46 795 Tx :[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]007
 <U1>02;16 659 Tx :[SAPI]00 C [TEI]000 [FRAME]RR    P [N(R)]007
 <U1>02;16 670  Rx:[SAPI]00 R [TEI]000 [FRAME]RR    F [N(R)]007
 <U1>02;22 661  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]007 [N(R)]007
               PD = Q.931(08)
               CR = 02 0004
```

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Figure 7-34 PRI Outgoing Call Connect and Release

BRI Call Monitor

The call-monitor jack located on the RBSU enables you to use a PC or ASCII terminal to monitor the BRI, D-channel call setup, layer-2 and layer-3 data (refer to Figure 7-32 on page 7-37 for information about connecting the monitor jack). Figures 7-35 and 7-36 provide examples of BRI call setup message information that is available from the RBSU call-monitor jack.

```
<U3>06;57'958 Tx :[SAPI]00 C [TEI]102 [FRAME]RR    P [N(R)]021
<U3>06;57'970  Rx:[SAPI]00 R [TEI]102 [FRAME]RR    F [N(R)]019
<U3>07;07'166  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]021 [N(R)]019
              PD = Q.931(08)
              CR = 01 0F
              MT = SETUP(05)
              04 03 80 90 A2 6C 05 C1 33 30 37 32 96 7B 01 81  .....l..3072.{..
<U3>07;07'217 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]022
<U3>07;07'735 Tx :[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]019 [N(R)]022
              PD = Q.931(08)
              CR = 01 8F
              MT = SETUP ACK(0D)
              18 01 89 1E 02 80 88 34 01 00 32 01 C2 95 2A 24  .......4..2...*$
              80 9E 14 44 49 41 4C 20 53 54 41 54 49 4F 4E 20  ...DIAL STATION
              4E 4F 2E 20 4F 52 20 9E 0B 41 43 43 45 53 53 20  NO. OR ..ACCESS
              43 4F 44 45                                      CODE
<U3>07;07'750  Rx:[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]020
<U3>07;07'866  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]022 [N(R)]020
              PD = Q.931(08)
              CR = 01 0F
              MT = INFO(7B)
              2C 01 31                                         ,.1
<U3>07;07'909 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]023
<U3>07;08'171  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]023 [N(R)]020
              PD = Q.931(08)
              CR = 01 0F
              MT = INFO(7B)
              2C 01 30                                         ,.0
<U3>07;08'192 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]024
<U3>07;08'415  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]024 [N(R)]020
              PD = Q.931(08)
              CR = 01 0F
              MT = INFO(7B)
              2C 01 30                                         ,.0
<U3>07;08'450 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]025
<U3>07;08'658  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]025 [N(R)]020
              PD = Q.931(08)
              CR = 01 0F
              MT = INFO(7B)
              2C 01 35                                         ,.5
<U3>07;08'682 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]026
<U3>07;08'941 Tx :[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]020 [N(R)]026
              PD = Q.931(08)
              CR = 01 8F
              MT = CALL PROC(02)
              18 01 89 32 01 82                                ...2..
<U3>07;08'958  Rx:[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]021
<U3>07;09'086 Tx :[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]021 [N(R)]026
              PD = Q.931(08)
              CR = 01 8F
              MT = ALERT(01)
              18 01 89 1E 02 80 88 34 01 40 95 2A 0B 80 9E 08  .......4.@.*....
              43 41 4C 4C 49 4E 47 20                          CALLING
<U3>07;09'106  Rx:[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]022
<U2>07;09'314 Tx :[SAPI]00 C [TEI]112 [FRAME]RR    P [N(R)]000
<U4>07;09'318  Rx:[SAPI]00 C [TEI]112 [FRAME]RR    P [N(R)]000
<U4>07;09'344 Tx :[SAPI]00 R [TEI]112 [FRAME]RR    F [N(R)]000
```

Figure 7-35 Outgoing Call Setup Output of BRI Call Monitor

```
<U2>07;40’993 Tx :[SAPI]00 R [TEI]113 [FRAME]RR    F [N(R)]000
<U4>07;40’997  Rx:[SAPI]00 R [TEI]113 [FRAME]RR    F [N(R)]000
<U4>07;41’000 Tx :[SAPI]00 R [TEI]113 [FRAME]RR    F [N(R)]000
<U2>07;41’005  Rx:[SAPI]00 R [TEI]113 [FRAME]RR    F [N(R)]000
<U3>07;41’168 Tx :[SAPI]00 C [TEI]102 [FRAME]RR    P [N(R)]027
<U3>07;41’180  Rx:[SAPI]00 R [TEI]102 [FRAME]RR    F [N(R)]025
<U3>07;53’481 Tx :[SAPI]00 C [TEI]127 [FRAME]U-INFO
              PD = Q.931(08)
              CR = 01 04
              MT = SETUP(05)
              04 03 80 90 A2 18 01 89 1E 02 80 83 6C 06 00 83  ............l...
              31 30 30 35 70 05 80 33 30 37 32 34 01 40        1005p..30724.@
<U3>07;53’514  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]027 [N(R)]025
              PD = Q.931(08)
              CR = 01 84
              MT = ALERT(01)
              18 01 89                                         ...
<U3>07;53’548 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]028
<U3>07;55’488  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]028 [N(R)]025
              PD = Q.931(08)
              CR = 01 84
              MT = CONN(07)
<U3>07;55’518 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]029
<U3>07;55’781 Tx :[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]025 [N(R)]029
              PD = Q.931(08)
              CR = 01 04
              MT = CONN ACK(0F)
              18 01 89 34 01 4F 95 2A 03 80 9E 00              ...4.O.*....
<U3>07;55’792  Rx:[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]026
<U3>07;57’585  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]029 [N(R)]026
              PD = Q.931(08)
              CR = 01 84
              MT = DISC(45)
              08 02 80 90                                      ....
<U3>07;57’619 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]030
<U3>07;57’942 Tx :[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]026 [N(R)]030
              PD = Q.931(08)
              CR = 01 04
              MT = REL(4D)
              08 02 80 90                                      ....
<U3>07;57’959  Rx:[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]027
<U3>07;57’979  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]030 [N(R)]027
              PD = Q.931(08)
              CR = 01 84
              MT = REL COMP(5A)
<U3>07;58’029 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]031
<U1>07;59’447 Await. Sig.(F4)
<U4>08;05’903 Tx :[SAPI]00 C [TEI]112 [FRAME]RR    P [N(R)]000
<U2>08;05’907  Rx:[SAPI]00 C [TEI]112 [FRAME]RR    P [N(R)]000
<U2>08;05’928 Tx :[SAPI]00 R [TEI]112 [FRAME]RR    F [N(R)]000
<U4>08;05’932  Rx:[SAPI]00 R [TEI]112 [FRAME]RR    F [N(R)]000
<U2>08;05’969 Tx :[SAPI]00 C [TEI]112 [FRAME]RR    P [N(R)]000
<U4>08;05’973  Rx:[SAPI]00 C [TEI]112 [FRAME]RR    P [N(R)]000
<U4>08;05’989 Tx :[SAPI]00 R [TEI]112 [FRAME]RR    F [N(R)]000
```

Figure 7-36 Incoming Call Setup Output of BRI Call Monitor

T1 8

This chapter covers the RDTU T1/DS-1 interface for the Strata CTX systems. It contains information about the RDTU3 and RDTU1/2. The RDTU3 is a replacement for the RDTU1 and 2.

Note "RDTU" refers to all RDTU (1, 2 or 3) PCBs. When a distinction is required, the exact numbered term, such as "RDTU3" is used.

Program Channels

The RDTU PCB provides T1/DS-1 interface for up to 24 channels on the Strata CTX. Each channel can be individually set for loop start, ground start, Tie, or DID line operation (voice only, not data lines). Each RDTU can be set in system programming to activate (1~8), (1~16), or (1~24) channels (lines). Fractional increments of 4, 12, and 20 are also possible but the RDTU still assigns 8, 16, or 24 channels respectively in system software.

Example: If only 12 channels of fractional T1 are used, assign RDTU as a 16 channel RDTU. The system assigns 16 CO lines to the RDTU even though only 12 CO lines are used.

Select Slot Assignments

RDTU PCBs can be installed in a Strata CTX to provide up to 264 lines (max). RDTU PCBs can be installed in any CTX cabinet, except remote CTX cabinets driven with RRCU cards. RDTU PCBs must be placed in designated slots in each of the Strata CTX cabinets. (See "Worksheet 5: Strata CTX100 Cabinet Slots" on page 2-26 and "Worksheet 6: Strata CTX670 Cabinet Slots" on page 2-37.)

If an RDTU is installed in a cabinet (in some cases one slot to the right of the RDTU may not be used in that cabinet) the number of unusable slots in a cabinet depends on which slot the RDTU occupies and how many lines (16 or 24) the RDTU is programmed to provide.

RDTU3 - T1 Interface Unit

System: *CTX100 & 670*
Circuits per PCB: *8, 16, 24 channels per PCB*
Interfaces with: *Ground / Loop start CO lines DID or TIE lines (Wink or Immediate)*
Older Version(s): *RDTU1, RDTU2*

The RDTU3A has an RS-232C port to trace data that is transmitted between the CTX system CPU and the RDTU3A. This PCB also enables T1 line alarm data to be monitored.

T1 Framing: D4 (SF) or ESF

Line cording: AMI with ZCS or B8ZS

Digital PAD: Transmit side +3dB to -15dB. Receive side +3dB to -15dB (software controlled)

Table 8-1 RDTU3 Controls, Indicators, and Connectors

Control/Indicator/ Connector	Type of Component	Description
SW4~SW6 Equalizer Setting Switch	Jumper switches	Sets the line length between RDTU and CSUs or other T1 (see also Table 8-6).
SW8, SW9	Jumper switches	Used for Self Test and CSU Test or for non-loop back normal operation (see also Table 8-5).
SW10	3-terminal jumper plug	See Table 8-3.
IC19	External ROM upgrade	Provides external ROM option (see Table 8-3).

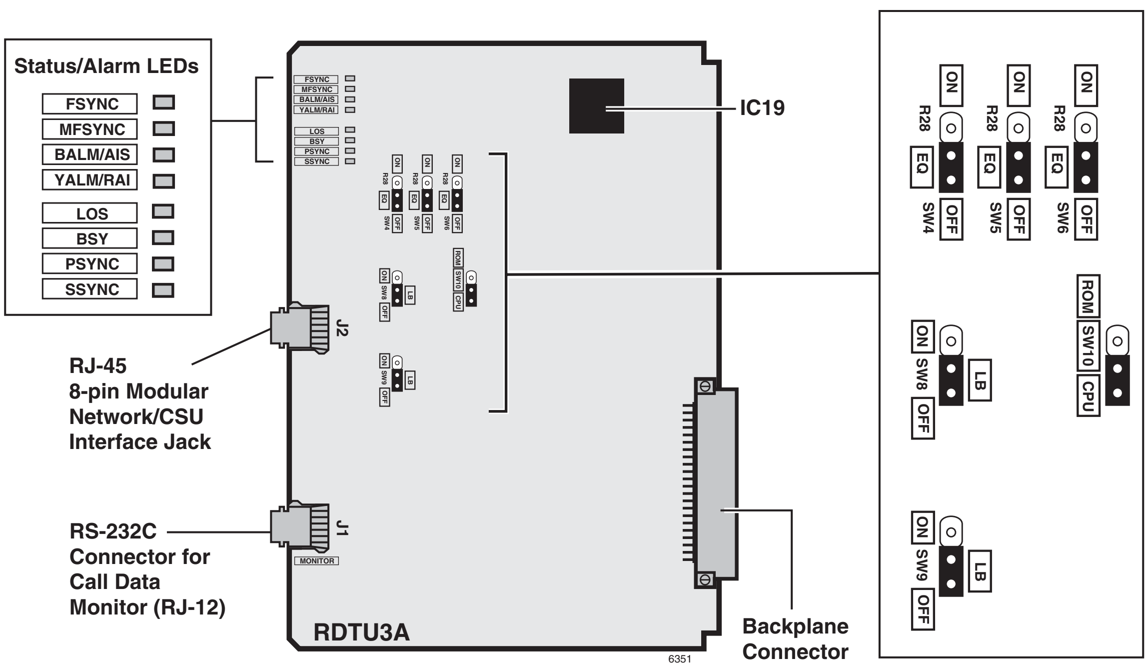


Figure 8-1 RDTU3 PCB

Table 8-2 RDTU3 LED Functions

RDTU3 LEDs	Indication
FSYNC	Frame Sync error indication On = No frame synchronization status Off = Frame synchronization status
MFSYNC	Multi-frame Sync error indication (same with FSYNC) On = No frame synchronization status Off = Frame synchronization status
BALM/AIS	Blue Alarm indication On = RDTU3A is receiving Blue Alarm Off = RDTU3A is not receiving Blue Alarm
YALM/RAI	Yellow Alarm indication On = RDTU3A is receiving Yellow Alarm Off = RDTU3A is not receiving Yellow Alarm
LOS	Signaling Loss indication On = RDTU3A is not receiving T1 signals Off = RDTU3A is receiving T1 signals
BSY	Busy state indication On = One or more RDTU channels are in use Or RDTU is not receiving T1 signals Off = No RDTU channel is in use Flashing = RDTU is in Remote Loop Back mode
PSYNC	Primary synchronization indication On = RDTU is assigned as the primary timing PCB Off = RDTU is not assigned as the primary timing PCB Flashing = RDTU is extracting T1 CLK
SSYNC	Secondary synchronization indication On = RDTU is assigned as the secondary timing PCB Off = RDTU is not assigned as the secondary timing PCB Flashing = RDTU is extracting T1 CLK

For more detailed information on these alarms, refer to Table 8-6 on page 8-8.

RDTU Installation

➤ To install an RDTU PCB

1. Set the jumper wire plugs to the correct position for the cable length.
    - RDTU3 – see “RDTU3 - T1 Interface Unit” on page 8-2
    - RDTU1 and 2– see “RDTU3 Cabling” on page 8-5.
2. Turn the Strata CTX system power Off.
3. Refer to Chapter 2 – Strata CTX Configuration to determine the appropriate slot for the RDTU:
    - “Worksheet 5: Strata CTX100 Cabinet Slots” on page 2-26
    - “Worksheet 6: Strata CTX670 Cabinet Slots” on page 2-37
    - “RDTU3 - T1 Interface Unit” on page 8-2 or “RDTU3 Cabling” on page 8-5
4. Insert the RDTU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper seating of connectors.
5. For the RDTU3 only, set the SW10 jumper plug for internal or external ROM operation, per Table 8-3.

Table 8-3 SW10 Internal or External ROM Setting

Mode	SW10	Note
Internal ROM (Default mode)	CPU	When there is an internal ROM on the CPU (TMP93PW46), RDTU3A operates with the SW10. Use this mode when IC19 is not on PCB (see Figure 8-1). If the SW10 is in CPU position, RDTU3A is operating with the internal ROM regardless of IC19 existence.
External ROM (Upgrade)	ROM	RDTU3A is operating with the external ROM (IC19). Use this mode only when IC19 is on PCB (see Figure 8-1). If the SW10 is in ROM position without IC19, the RDTU3A will not work.

Note For cabling information and requirements, refer to the specific instructions for the type of card.

Power Factor

RDTU3A uses 5V only. 5V power factor = 2.0, -24PF = 0.0

Ferrite Core

Install the Ferrite core provided with the RDTU3 PCB, as shown in Figure 8-2. This core is needed to comply with FCC requirements.

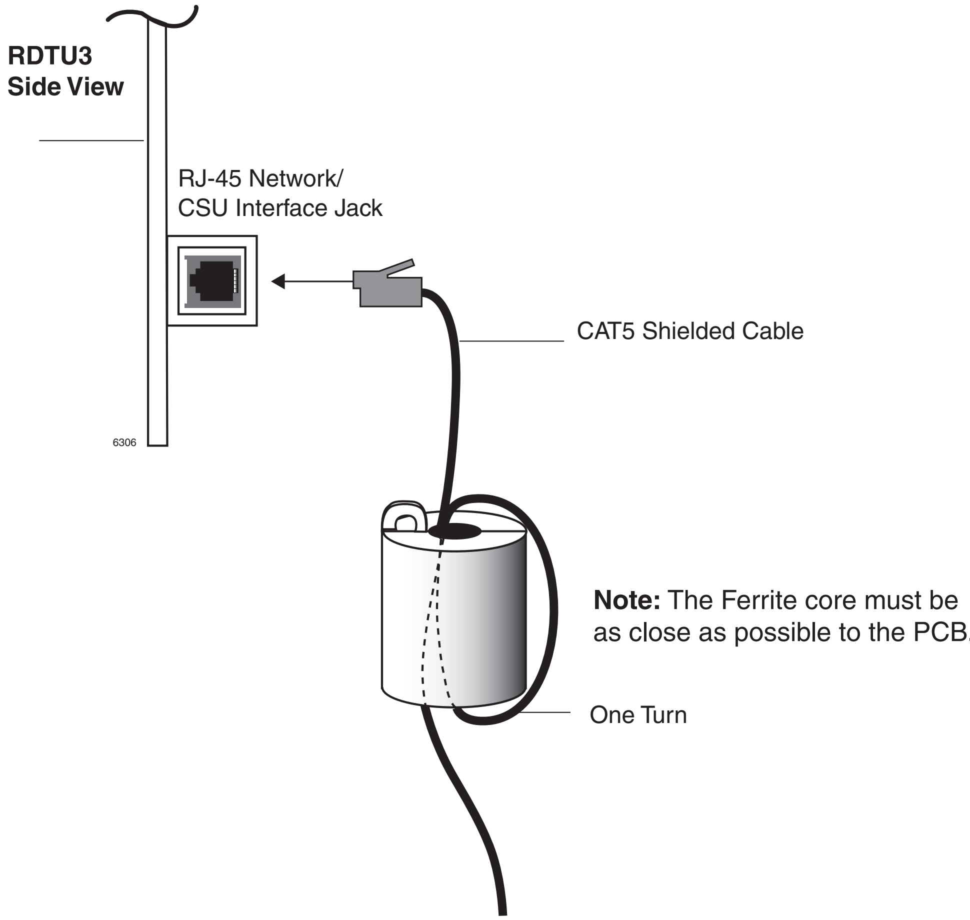


Figure 8-2 RDTU3 Ferrite Core Installation

RDTU3 Cabling

Each RDTU3 T1 PCB requires the following connecting equipment and cables to provide service (see the following sections and Figure 8-3).

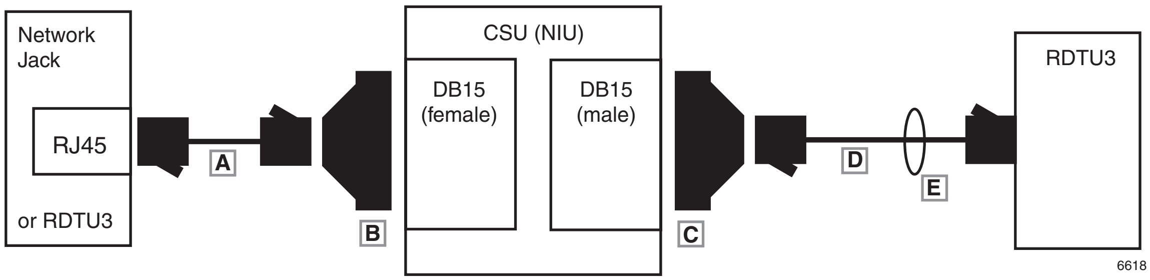
RDTU3 to Network

If the RDTU3 must interface to a public telephone network or common carrier T1 circuit, the RDTU3 must be connected to a CSU. Use the RDTU3-CBL-KIT to connect the RDTU to the CSU. The function of the CSU is to provide the required interface between the RDTU PCB and the Public Telephone or Carrier Network. The interface created by the CSU normally provides protection and capabilities for loop back testing both the Network equipment and the RDTU PCB.

Connecting the CSU to the Network Interface Unit (NIU) is specified by the CSU manufacturer—see CSU installation documentation. The RDTU3-CBL-KIT supplies the cables and connectors required to connect the CSU to the NIU.

RDTU3 to PBX T1 (Separated More Than 655 ft.)

If the RDTU3 must interface to a customer's premises T1 circuit (PBX, key/hybrid, or another Strata CTX) to provide Tie line service, the RDTU3 must be connected to a CSU (with Toshiba cable kit RDTU3-CBL-KIT) if the other customer premise T1 equipment is more than 655 ft. from the RDTU. The T1 span on the other end must also connect to a CSU.



Item	Description
A[1]	15 feet of CAT5 unshielded cable
B	1 DB15 modular adapter (CSU to network jack)
C	1 DB15 modular adapter (CSU to RPTU)
D[1]	30 feet of CAT5 shielded cable
E	1 Ferrite core (supplied with RDTU3 PCB)

1. Items A and D come with the RDTU3-CBL-KIT.
   Items A and D are straight-pinned data cables, not cross-pinned telephony cables.

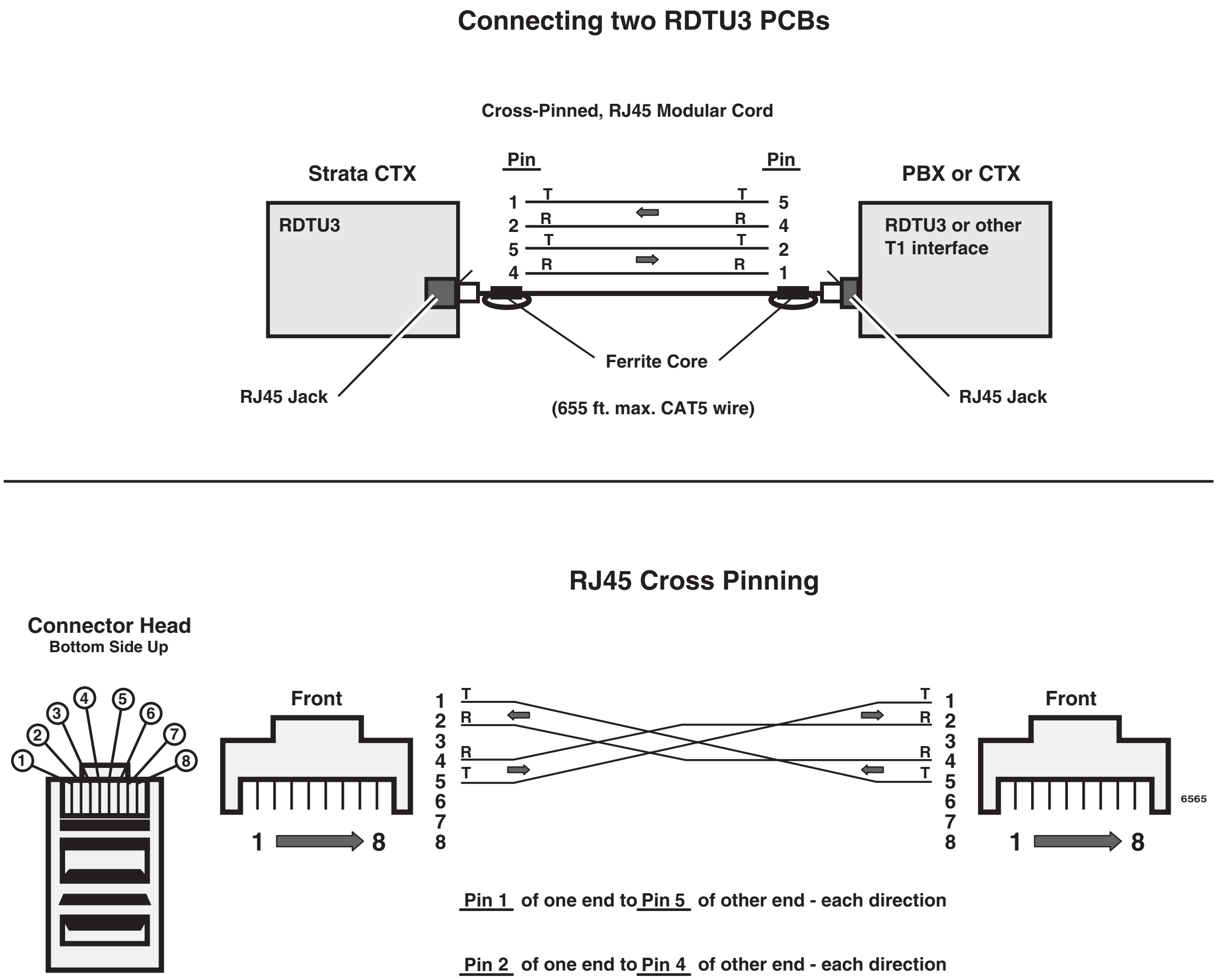
Figure 8-3 RDTU3 Connection to Digital Network or OCC

Table 8-4 Detailed Pinouts for RDTU3 Network Jack

Network Jack/RDTU3 Modular Jack	
Pin	**Function**
1	Tip – Receives from the network
2	Ring – Receives from the network
3	Not Used
4	Ring – Transmits to the network
5	Tip – Transmits to the network
6	Not Used
7	Not Used
8	Not Used

RDTU to PBX T1 - Direct Back-to-back Connection (up to 655 ft.)

If the RDTU is within 655 ft. of the far-end PBX T1 circuit, a CSU is not required. However, connecting a RDTU T1 span to another PBX or Key/Hybrid T1, in a Tie line configuration at a distance less than 655 ft. (without a CSU) will require a customer provided special cable. The transmit and receive pair of this span cable must be crossed pairs and the wires must be 24 AWG, twisted pair, otherwise 22 AWG, ABAM type cable must be used. (See Figure 8-4.)



To make a Cross-Pinned Modular Cord on a existing straight through cord:
On one end only, swap Pin 1 with Pin 5 and then Pin 2 with Pin 4.

Figure 8-4 Required Cables/Connectors for RDTU Connection at Distances of Less than 655 (200 Meters)

RDTU3 Self Test and CSU Test Switch

1. Remove the RJ45 cable to perform the Self Test.
2. Set the SW8 and SW9 switches to On (see Table 8-5).
3. After self check passes, put the switches back into position for normal operation and insert the RDTU PCB back into the appropriate slot.

Table 8-5 SW8, SW9 RDTU3A Self and CSU Test

Mode	SW8 and SW9
RDTU3A self test and CSU test mode	Both On All LEDS turn Off except PSYNCH or SYNCH
Normal operation (non-loop back)	Both Off

RDTU3 Equalizer Switches

The distance between the Strata CTX, RDTU and CSU or RDTU to other Customer Premise Equipment (CPE) T1 may vary (0~655 ft.) as shown. (See “RDTU3 Cabling” on page 8-5.) The RDTU interface transmitter must be equalized and its impedance must be matched to the cable length connecting the RDTU to the CSU or other CPE, T1.

➤ Set the appropriate SW1 Equalizer Switch setting and set SW1 to the setting that matches the RDTU cable length (see Table 8-6).

Table 8-6 Equalizer Setting Switch

Mode	Feet from CTX	SW4	SW5	SW6
Short	0 to 133 feet	Off	Off	Off
Semi-short	133 to 266 feet	On	Off	Off
Medium	266 to 399 feet	Off	On	Off
Semi-long	399 to 533 feet	On	On	Off
Long	533 to 655 feet	X	X	On

X = Doesn’t matter.

RDTU3 Loop Back Jumper Plugs

The RDTU PCB provides jumper plugs for loop back testing. Loop back tests are described in “Loop Back Testing” on page 8-19. See Table 8-5 for switch settings for Loop Back tests.

RDTU3 Front Panel Indicators

The RDTU3 PCB provides seven LED indicators to show the status of RDTU: Busy or Idle condition, Alarm status, and Synchronization status. See Table 8-2 for the function of each status LED. Figure 8-1 shows the LED locations. Busy LED (BSY)—Turns on when one or more RDTU channels (lines) are in use. Also, when the RDTU does not receive the far end 1.544 mbs carrier signal, the RDTU will cause the BSY to be on steady.

Call Data Monitor Jack

RDTU3A has an RS-232C port for maintenance monitoring and troubleshooting purposes. This should be used when requested by Toshiba Technical Support Engineers.

Communication parameters are 9600bps, 8, and 1.

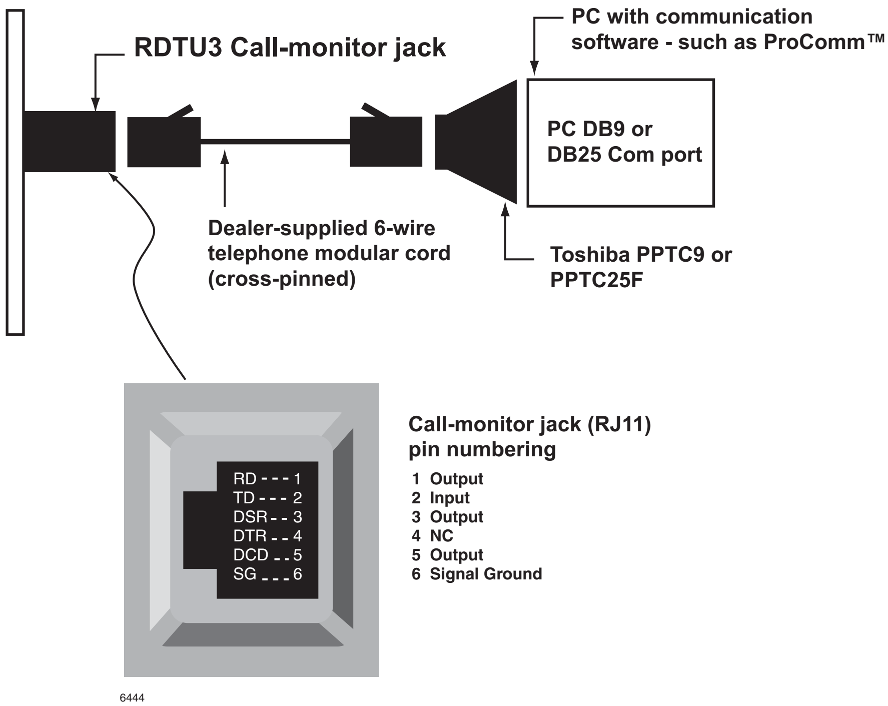


Figure 8-5 Call Monitor Jack for the RDTU3

Loop Back

You can put the RDTU3A in remote loop back mode with this port.

The command “L” and “Q” are used for remote loop back command.

L = Start remote loop back mode

Q = Quit remote loop back mode

Remote loop back commands are shown below.

l	Echo back
L	RDTU outputs L and BSY LED flashes
q	Echo back
Q	RDTU outputs Q and BSY LED is operating normal

The RDTU3A loop back test can made with the same process described in “Network/CSU/RDTU Span Test” on page 8-20. Refer to Figure 8-12 on page 8-21.

RDTU3A Call Data Information

RDTU3A has an RS-232C port to trace data that the RDTU3A sends and receives from the CTX system processor. The T1 line alarm data can also be monitored with the RDTU3.

Commands

You can type the commands in the following table to check the status indicators also described in the table below.

Table 8-7 RDTU3 Status Commands

Command	Function	Format	Indication
U	When you power On or when you enter "U," the unit name and software version appears.	u [RTN]	RDTU3A © TOSHIBA 2002 VER.1A UNIT MODE:FFMxx SCHxx TSxx RPDxxxx TPDxxxx ZCSxx ERR:CRCyyy SLPyyy FSYyyyy BPVyyyyy ALARM:YA on/off BA on/off FSL on/off CRC = CRC Error in ESF mode SLP = Slip error FSY = Frame Sync error BPV = Bipolar violation error
CH	Channel mode check command	C v [RTN] v = 0 to 23 Note: H = 1 or 0	CH.vv : DTxx DRyy DDTon/off CH MODE: Ax Explanation: CH.vv:vv = channel numbers 0~23 DTxx:xx = DHin data code for RDTU3A to RCTU (see Table 8-9) DTyy:yy = DHout datacode RCTU to RDTU3A (see Table 8-10) DDTon/off: DDT1 = RDTU cannot receive requests from the central processor at this time (see following Notes). DDT0 = RDTU is available to receive requests from the central processor CH MODE: A8 = CO loop, A0 = CP grpimd. AA = Tie immediate, AB = Tie Wink, AC = DID Immediate, AD = DID WInk This information is the same as "2-2 Data-HWY code" and "2-5 Channel Trunk Type information."
Loop back	Set RDTU3A into the Remote Loop Back mode Useful for checking remote equipment. When RDTU3A is in this mode, BSY LED will flush.	L [RTN]	L
Quit Loop back	Quit Loop back mode	Q [RTN]	Q

Notes

- There are some cases when the RDTU will not receive requests from the central processor unit (CPU), such as the time waiting for wink signal. When the RDTU attempts to move to a non-receiving state, the RDTU sends commands to the CPU to stop sending requests. The CPU stops sending requests until the RDTU cancels the stop. "DDT1" indicates that the RDTU is in a non-receiving state.
- Dial pulse digits are communicated using A/B bits, so the RDTU can detect and send out from the monitor port. DTMF digits cannot monitored because they pass through the speech path.

Indicators

When the conditions described in the "Timing" column of the table below occur, the information in the "Indication" column appears on-screen.

Table 8-8 RDTU3 Indications

Indication Type	Indication	Timing
Alarm information	ALARM:YAON/OFF BAON/OFF FSLON/OFF YA = Yellow Alarm BA = Blue Alarm FSL = Frame Sync Loss	Occurs when the T1 line alarm state changes. When all Alarms are OFF state, RDTU3A gets frame sync.
	UNIT MODE: FFMxx SCHxx TSxx RPDxxxx TPDxxxx ZCSxx FFM = Frame format mode 01 = D4 mode 10 = ESF mode SCH = Sync operation CHannel 01 = Primary CLK extraction channel 10 = Secondary CLK extraction channel TS = Voice channel number 01 = 8 PCM ch 10 = 16 PCM ch 11 = 24 PCM ch RPD = Receive digital PAD setting 0001/0010 = +3dB 0011 = 0dB 0100 = -3dB 0101 = -6dB 0110 = -9dB 0111 = -12dB _______1000 = -15dB TPD = Transmit digital PAD 0001/0010 = +3dB 0011 = 0dB 0100 = -3dB 0101 = -6dB 0110 = -9dB 0111 = -12dB 1000 = -15dB ZCS = Zero Code Suppression mode 01 = PZC (Not used) 10 = B8ZS 11 = AMI with ZCS	If you change the card in programming, the above indication information displays.
Channel Trunk Type Information	CH MODEx-y:Az Az Az Az Az Az x-y = channel number 0-5/6-11/12-17/18-23 Az = Channel mode A8 = CO Loop A9 = CO Ground AA = TIE Immediate AB = TIE Wink AC = DID Immediate AD = DID Wink	If you change the trunk type in programming, the above data displays.

Table 8-8 RDTU3 Indications *(continued)*

Indication Type	Indication	Timing
TLCS-900 stack pointer and program counter information	SP = xxxxxxh PC = yyyyyyh	Watch Dog Timer reset will occur.
Data-HWY code	CH.xx DTyy DRzz DDT1/0 xx = channel number, from 0 to 23 yy = DHin data code (RDTU3A to RCTU) See Table 8-9. zz = DHout data code (RCTU to RDTU3A) See Table 8-10. DDT1 means Don't Disturb Time. DDT0 is normal time.	Changing of yy or zz or DDT will occur. Each voice channel's DHin and DHout data will be indicated.

Table 8-9 DT (DHin) Data Code

Data (Hex)	Meaning
00	No error T1 unit operation is good.
01	Receive B-bit fall down (Ringing signal for CO Loop/Ground)
02	Receive B-bit rise up (Ringing signals for CO Loop/Ground)
09	Receive Off-Hook from line
0A	Receive On-Hook from line
11	Receive DP Dial 1
12	Receive DP Dial 2
13	Receive DP Dial 3
14	Receive DP Dial 4
15	Receive DP Dial 5
16	Receive DP Dial 6
17	Receive DP Dial 7
18	Receive DP Dial 8
19	Receive DP Dial 9
1A	Receive DP Dial 0
21	Receive A-bit rise up (Idle signal for CO Ground)
22	Receive A-bit fall down (Seizer signal for CO Ground)
23	Receive answer from line
40	No error
41	Frame-bit error
42	CRC error
43	Frame-bit error and CRC error
44	Slip error
45	Frame-bit error and Slip error
46	CRC error and Slip error
47	Frame-bit error and CRC error and Slip error

Table 8-9 DT (DHin) Data Code *(continued)*

Data (Hex)	Meaning
48	Bipolar violation
49	Frame-bit error and Bipolar violation
4A	CRC error and Bipolar violation
4B	Frame-bit error and CRC error and Bipolar violation
4C	Slip error and Bipolar violation
4D	Frame error and Slip error and Bipolar violation
4E	CRC error and Slip error and Bipolar violation
4F	Frame error and Slip error and CRC error and Bipolar violation
7B	Receive Dial error
7C	Receive Wink error
80	Idle code

Table 8-10 DR (DHout) Data Code

Data (Hex)	Meaning
01	Request out going call
02	Off-Hook
03	Ready to receive dial
04	On-Hook
08	Send Off-Hook
11	Send Dial Digit 1
12	Send Dial Digit 2
13	Send Dial Digit 3
14	Send Dial Digit 4
15	Send Dial Digit 5
16	Send Dial Digit 6
17	Send Dial Digit 7
18	Send Dial Digit 8
19	Send Dial Digit 9
1A	Send Dial Digit 0
41 to 5F	Flash time setting From 0.1S to 3.1S
61 to 7F	Pause time setting From 0.1S to 3.1S
A1	Status confirmation
A8	Set this channel as CO Loop
A9	Set this channel as CO Ground
AA	Set this channel as TIE Immediate
AB	Set this channel as TIE Wink
AC	Set this channel as DID Immediate
AD	Set this channel as DID Wink
B0	Dial speed 650mS 10pps 40%
B1	Dial speed 650mS 10pps 33%
B2	Dial speed 500mS 20pps 40%
B3	Dial speed 500mS 20pps 33%
B4	Dial speed 850mS 10pps 40%
B5	Dial speed 850mS 10pps 33%
B6	Dial speed 850mS 20pps 40%
B7	Dial speed 850mS 20pps 33%
B8	Dial speed 850mS 10pps 40%
B9	Dial speed 850mS 10pps 33%
BA	Dial speed 850mS 20pps 40%
BB	Dial speed 850mS 20pps 33%
BC	Dial speed 850mS 10pps 40%
BD	Dial speed 850mS 10pps 33%
BE	Dial speed 850mS 20pps 40%
BF	Dial speed 850mS 20pps 33%
80	Idle code

RDTU1 & 2 - T1 Interface Unit

Circuits per PCB: *8, 16, or 24 channels*

Interfaces with: *ground start CO lines*
loop start CO lines
DID or Tie lines

Older Version(s): *none*

RDTU is configured for Tie or DID lines and an RRCS must be installed for DTMF operation. LEDs on the RDTU show a continuous status of RDTU operation. The Strata CTX can support up to eight RDTU2 or RPTU2 PCBs total.

RDTU controls and interface connectors are shown in Figure 8-7 and described in Table 8-12.

The RDTU requires installation of a customer-provided Channel Service Unit (CSU). Refer to "CSU Installation" on page 8-19 for CSU installation.

Testing procedures (local loop back and remote loop back) are in "Loop Back Testing" on page 8-19.

SW1 Equalizer Switch and Loop Back Jumpers (Internal Option)

The distance between the Strata CTX cabinets and the CSU (or other customer premise T1 circuit) determines the setting of the SW1 Equalizer Switch. The SW1 switch consists of a bank of smaller switches, S1~S7.

➤ Set the SW1 switch per Table 8-11.

Table 8-11 RDTU1 & 2 Equalizer Switch and Loop Back Jumpers

Mode	Feet from Strata CTX	S1	S2	S3	S4	S5	S6	S7	S8
Short	0~150	On	Off	Off	Off	Off	Off	Off	N/A
Medium	151~450	Off	On	Off	On	Off	On	Off	N/A
Long	450~655	Off	Off	On	Off	On	Off	On	N/A

Note The maximum distance between the RDTU and the CSU or other T1 circuits can not be more than 655 feet (see "RDTU to PBX T1 (Separated More Than 655 ft.)" on page 8-6).

RDTU1 & 2 Installation

1. Set jumper wire plugs P1 (LB), P2, P3, and P4 to the Off position. See "Loop Back Testing" on page 8-19 for loop back testing procedures.

   See "SW1 Equalizer Switch and Loop Back Jumpers (Internal Option)" on page 8-15 for the appropriate SW1 equalizer switch setting.

2. Insert the RDTU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors. (See "Worksheet 6: Strata CTX670 Cabinet Slots" on page 2-37 for RDTU slot assignment recommendations.) (See Figure 8-6.)

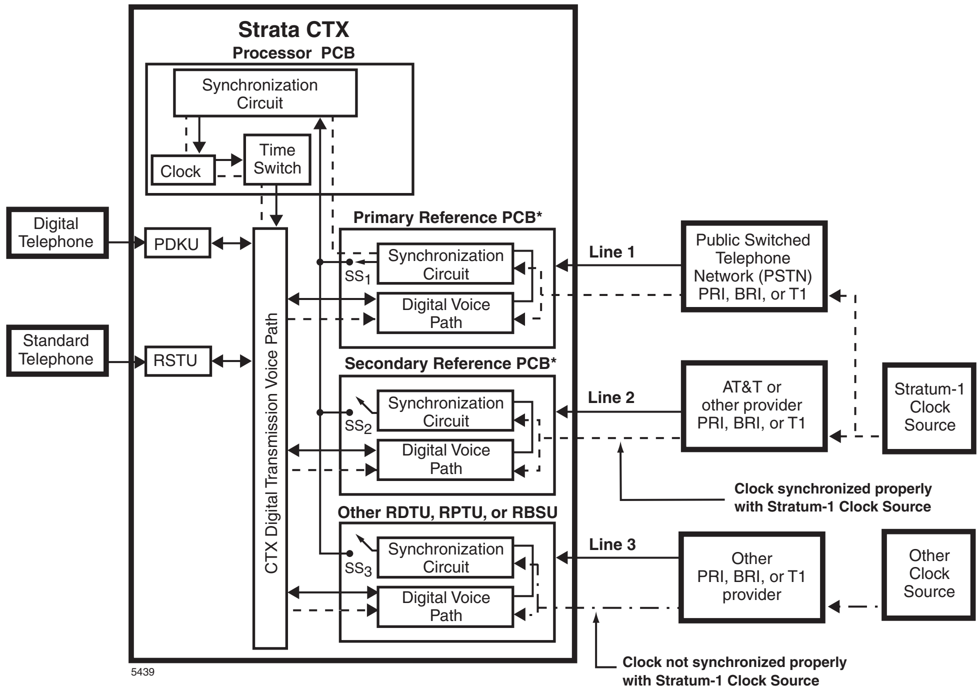


Figure 8-6 RDTU Primary/Secondary Reference Block Diagram

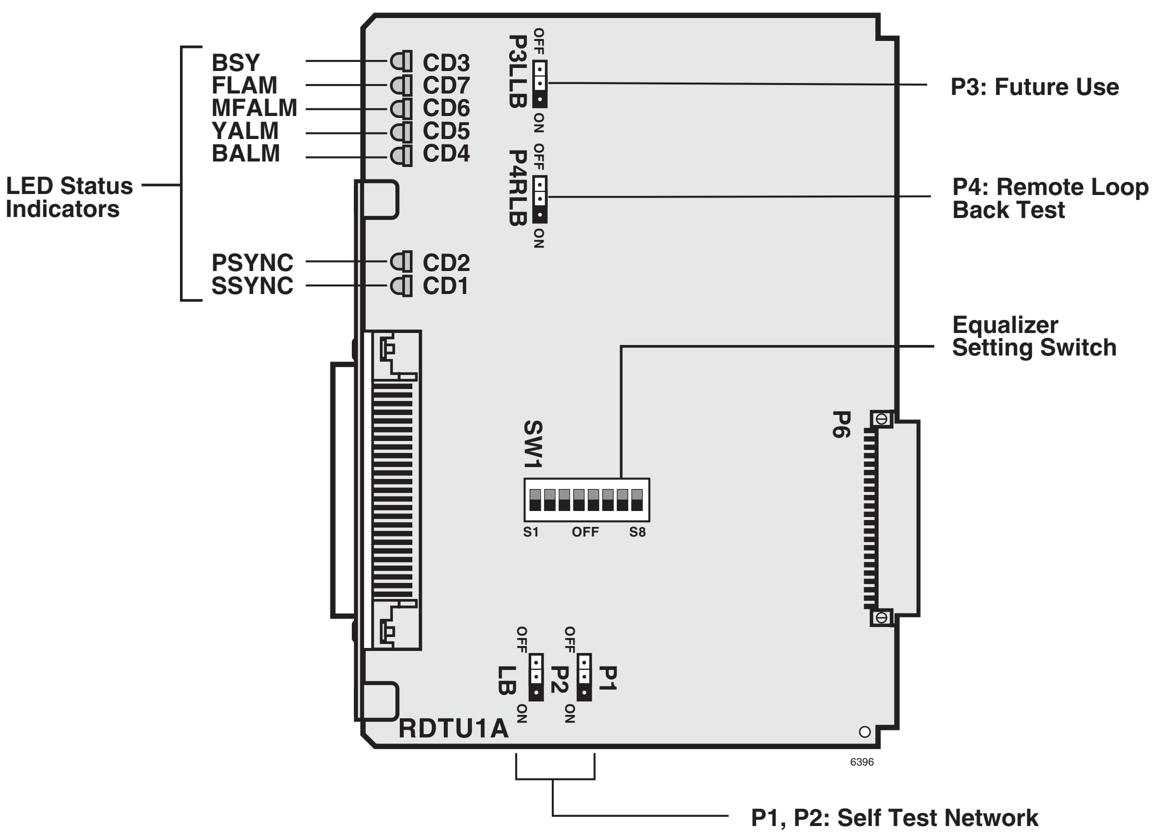


Figure 8-7 RDTU1A PCB (RDTU2 is similar)

Alarms are used to indicate potentially serious telephone network problems. Example: when monitoring a T1 network, if a Blue or Yellow alarm is indicated, it can be concluded that there is a cable fault or some other serious transmission impairment.

Table 8-12 RDTU1 and 2 LED Functions

Alarm LED	Function
Frame Alarm (FALM)	Turns On steady if the RDTU has not achieved synchronization or when the span cable is not connected.
Multi-Frame Alarm (MFALM)	LEDs turn On steady if the RDTU receives the 1.554 mbs T1 carrier from the far end, but has not achieved Frame synchronization or when the span cable is not connected. Also, if the RDTU is set for SF and the far end is sending ESF (or vice versa), the MFALM LED will be On steady.
Red Alarm (FALM and MFALM)	When FALM and MFALM are both On steady, it's a Red alarm condition. This means the RDTU does not detect a proper carrier signal (1.544 mbs T1) on its receive pair and the RDTU is not synchronized. During a Red alarm condition, the RDTU turns the BSY LED On steady and attempts to send a Yellow alarm signal (RDTU YALM LED flashes) to the far end T1 circuit.
Yellow Alarm (YALM)	When the far end network or CPE T1 does not detect the RDTU transmitted 1.544 mbs T1 carrier signal on its receive pair the far end, T1 sends a Yellow alarm signal pattern to the RDTU. The RDTU should turn on the YALM LED (the YALM repeats the signal it receives from the far end—flashing or steady). If the RDTU does not receive the far end carrier signal, the RDTU sends the Yellow alarm signal to the far end and causes the BSY and YALM LEDs to flash.
Blue Alarm (BALM)	The Blue alarm, also known as the Alarm Indication Signal (AIS), is detected by the RDTU. This signal is sent by the Far End Network equipment to RDTU when it loses the carrier from a Network T1 circuit (other than RDTU). This signal assures that the RDTU maintains synchronization when there is a problem between two Network Nodes. The RDTU BALM also lights if the far end sends a Blue alarm signal during loop back. The RDTU sends a Blue alarm signal when loop-back test is being performed.
Primary Synchronization (PSYNC)	See Figure 8-6 on page 8-16 – If one RDTU PCB is assigned as the Primary Timing T1 PCB in Program 105, the PSYNC LED of this RDTU PCB flashes when it is synchronized with the far end T1 span line clock provider. If the Primary RDTU is not synchronized with the clock provider, the PSYNC LED will be On steady. The SSYNC LED of the Primary sync RDTU PCB should always be Off. The Primary sync RDTU PCB synchronizes the RTCU (time-switch) to the clock signal it receives from the T1 span circuit to which it is connected. The RTCU then synchronizes the Strata CTX PCM talk path (time-switch) to the far end PCM talk path.
Secondary Synchronization (SSYNC)	If an RDTU PCB is assigned as the Secondary time T1 PCB in Program 105, its SSYNC LED will be On steady (standby mode) when the Strata CTX is synchronized to the Primary T1 clock provider. In the event Primary synchronization is lost (4 out of 12 consecutive frame timing bits are in error), the Strata CTX switches from synchronizing to the Primary RDTU span line clock to the span line clock connected RDTU designated as the Secondary Timing Reference. When the Strata CTX is synchronized to the Secondary Reference RDTU, the PSYNC LED on the Primary Reference RDTU turns on steady and the SSYNC LED on the Secondary Reference RDTU will flash.
Run Free (PSYNC/SSYNC)	If the RDTU PCB is the clock provider to the Far-end T1 span circuit, both the PSYNC and SSYNC LEDs are always Off.

T1

RDTU1 and 2 Cable Installation

The RDTU PCB is shipped with a Toshiba cable for connecting the RDTU PCB to a CSU. The 30 ft. cable is specially made to conform with EIA specifications (see Figure 8-8).

All other cables required to connect the T1 span line to the RDTU PCB are customer-supplied and must conform with EIA specification, see the Notes of Figure 8-8. Almost all CSU manufacturers supply cables that comply with T1 span specifications for connecting the CSU to customer premise equipment (like Strata CTX, RDTU) to the Network Interface equipment.

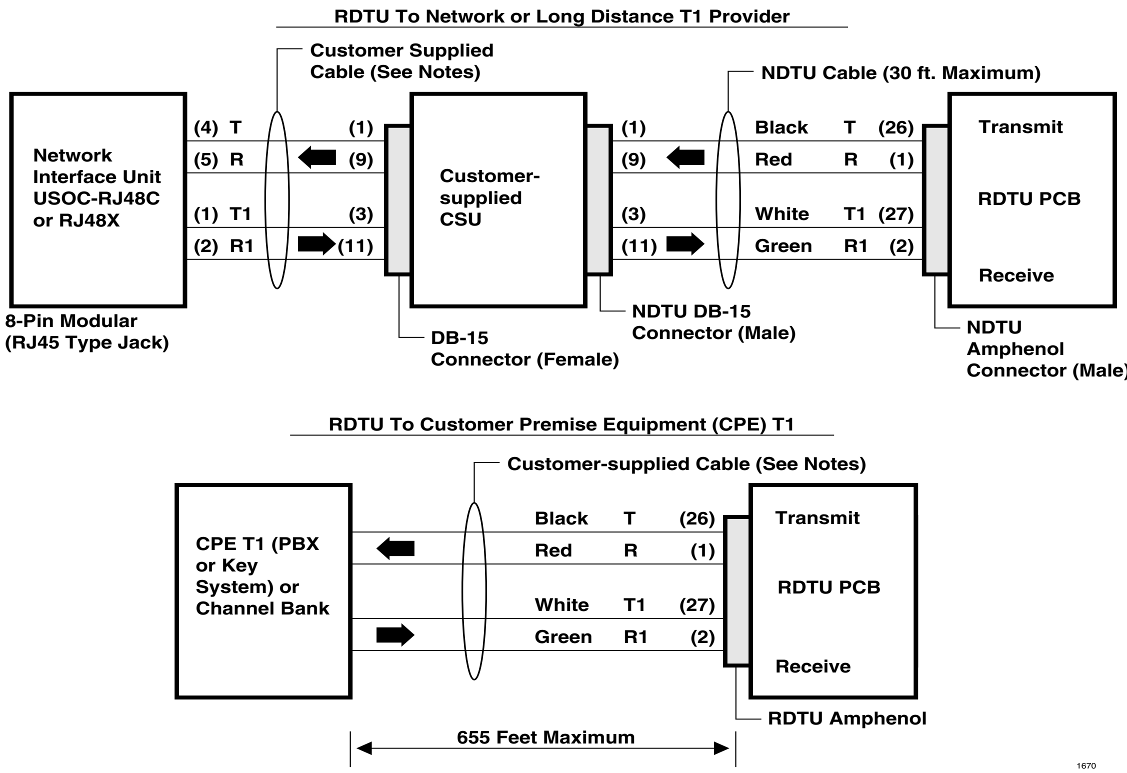


Figure 8-8 RDTU Cable Connections

Notes

- Pins 2 and 4 of the DB-15 connector in most CSUs are frame ground. No connection is required.
- NDTU cable is supplied with RDTU PCB (30 ft. maximum).
- Customer-supplied span cables must be 22 AWG, ABAM cable or, if using standard 24 AWG twisted pair, the transmit pair must be separated from the receive pair by at least 5-cable pairs. Most CSU manufacturers supply cables to connect the CSU to the Network Interface Unit or other CPE equipment.

CSU Installation

➤ Install the CSUs and wire them to the RDTU and NIU or customer premises T1 circuit, as required (see Figure 8-9).

Note Before connecting the CSU to the Telco line, notify the T1 provider. You should also notify the T1 provider before disconnecting the CSU.

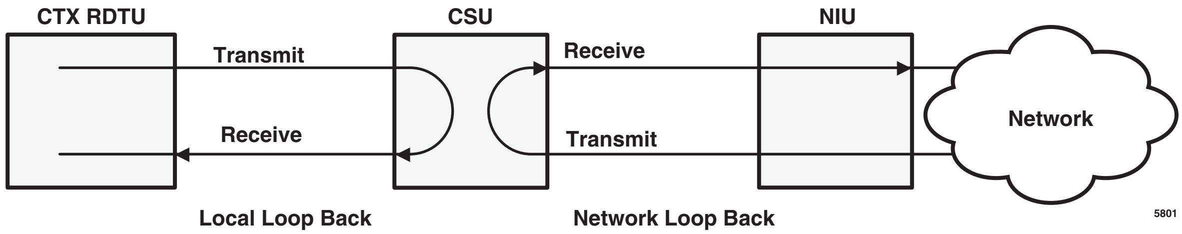


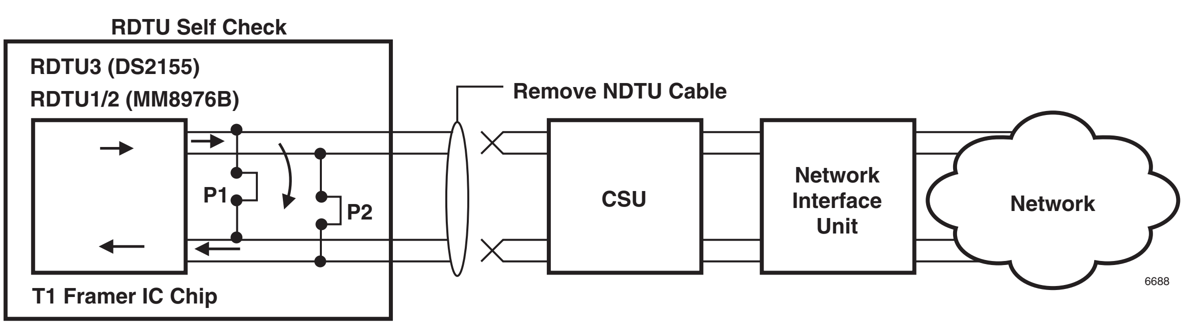
Figure 8-9 CSU Local and Network Loop Back Tests

Loop Back Testing

The RDTU provides three loop back test configurations. These loop back tests should be performed as required in conjunction with CSU loop back tests (see CSU loop back test documentation).

RDTU Self Test

This test should be performed upon initial installation of a RDTU PCB. Program the RDTU per the *Strata CTX Programming Manual*; then perform the RDTU loop back test, per the instructions in Figure 8-10, before connecting the far end (CSU, Network, or CPE) T1 span line.



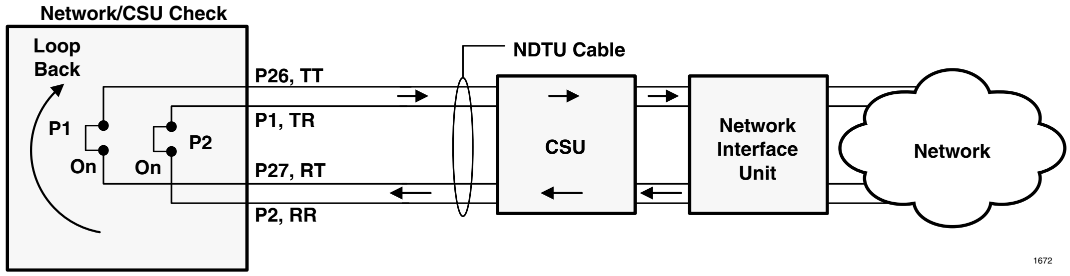
Notes

- RDTU1 & 2, move P1 and P2 to On (see Figure 8-7); RDTU3 move SW8 & SW9 to On.
- Remove NDTU cable from RDTU amphenol connector.
- After about 12 seconds, all RDTU LEDs (except PRI/SEC SYNC) turn Off.
- Appropriate Primary or Secondary sync. LED flashes if RDTU is Primary or Secondary reference.
- If RDTU is not a Primary or Secondary reference, then the Primary and Secondary sync LEDs should turn Off.
- Do not use the RDTU3A as a clock extraction unit.

Figure 8-10 RDTU Self Test

Network/CSU T1 Span Test

This test verifies that the far end (CSU, Network, or CPE) T1 equipment and span cabling is functioning properly. This test checks all T1 span cabling including the RDTU Amphenol cable and connector. Guidelines for this test are provided in Figure 8-11.



Notes

- P1 and P2 to On position (see Figure 8-7).
- Unplug RDTU from Strata CTX back plane.
- CSU or Network T1 equipment should receive its own transmitted signal.
- Indications and results depend on CSU and/or Network equipment.
- Do not use the RDTU3A as a clock extraction unit.

Figure 8-11 Network/CSU T1 Span Test

Network/CSU/RDTU Span Test

This test checks all equipment that is checked with the test in the above paragraph, but this test also checks that the RDTU Mitel LSI chip is functioning. Examples for this test are shown in Figures 8-10~8-12.

Note Loop back tests with CSU and Network equipment can also be performed when connecting the RDTU PCB directly to a customer premise (PBX, Key Hybrid, Channel bank) T1 circuit.

The RDTU Self Test is an active test of the RDTU circuit.

The Network/CSU Test checks all cables, the Network and CSU equipment (RDTU is not active).

The Remote Loop Back (RLB) Test is an Active test of RDTU (LSI MM8976B or DS2155), CSU, Network equipment and all cables.

Refer to Figure 8-3 and the CSU manufacturer's Installation and Maintenance manual for information on CSU Local/Network Loopback Tests.

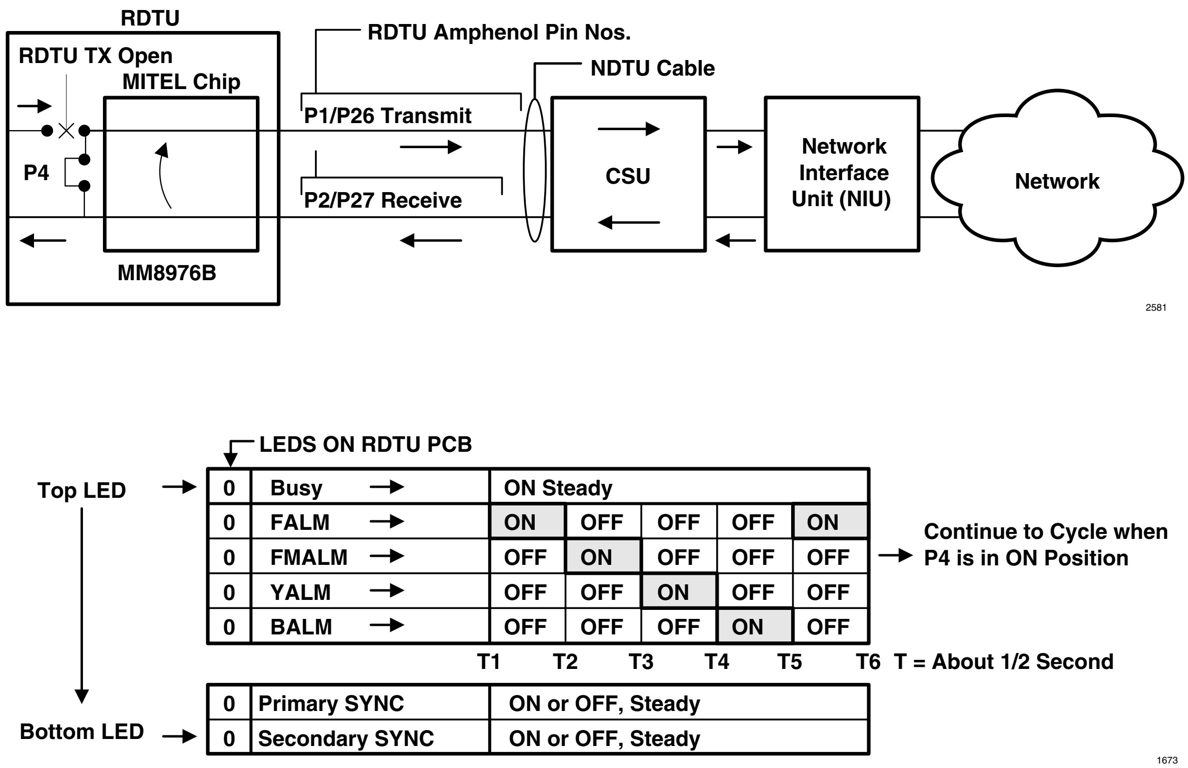


Figure 8-12 Network/CSU/RDTU Span Test

Notes

- Local loop back and network loop back test cannot be performed simultaneously.
- CSU local/network loop back is a function of the CSU, not all CSUs provide this function – see CSU I&M documentation for CSU loop back test procedures.

Test RDTU Lines

➤ After loop back testing is complete and synchronized with the far end T1 circuit, perform test calls on all RDTU lines.

IP Telephony and QSIG Over IP 9

This chapter explains how to install the Strata CTX Internet Protocol (IP) telephones (IPT1020-SD). It also covers installing the Internet Protocol Telephone (IPT) interface (BIPU-M2A or BIPU-M1A) units into Strata CTX systems with Release 2.0 or higher software, as well as the Strata Net QSIG over IP Interface Unit (BIPU-Q1A) that requires CTX Release 2.1 software.

The BIPU-M2A provides Network Address Translation (NAT) compatibility; whereas, BIPU-M1A requires a Virtual Private Network (VPN) connection for remote IP telephone connections.

IPTs support most CTX telephone features. As of this release, Speaker OCA is the only CTX telephone feature not supported by IPT1020-SD telephones. Handset OCA is supported.

CTX WinAdmin 2.1 or higher is required to program CTX Release 2.0 software. This is available on FYI and on the Strata CTX WinAdmin Application Software and CTX/DK/Partner Products Documentation Library CD-ROM.

Pre-installation Guidelines

In general, it's important to obtain as much information as possible about the client's telephone network topology. Below are examples of the kind of information that you need to know up front.

- ❒ Determine what type of IPT to network connections would be best for the client: switch, LAN, or VPN. Refer to "Step 4: Connect IPTs to Network" on page 9-13 for more information.
- ❒ Find out who is the client's IP carrier or provider.
- ❒ Find out if that IP carrier or provider allows more than one IP address per off-site system. Some providers offer multiple IP addresses, others may offer only one. This limitation should be discussed with the client.
- ❒ Are there other limitations for the IP carrier/provider regarding internet access. For example, some services require a user authorization number to access the internet. You will need this information. Inquire about Point-to-point Over Ethernet (PPOE) restrictions.
- ❒ How much bandwidth is available for IP connections?
- ❒ The client's IR department needs to extend their LAN to the networked location.
- ❒ Toshiba recommends that you perform a LAN Voice Readiness Assessment if installing IPTs on your LAN. Quality of Service (QoS) and calls are highly dependent on setting up correct quality parameters. Refer to "Step 1: Perform a LAN Voice Readiness Assessment" on page 9-3.

Client Firewall Considerations

When installing a CTX with IP, you need to obtain information about your client's firewall.

❒ Will the client allow you access through their firewall? If not, you will have to configure around their firewall.

In case of providing services like packet filtering by setting a firewall between the terminal used for the "IPT Anywhere" environment and the BIPU-MIA interface, you need to prepare an appropriate setting that allows IPT control signals and voice signals to penetrate the packet filter and other features of the firewall.

❒ If your clients are using Zonealarm® and Microsoft Windows XP®, you have to enable the following:

- COM surrogate: access to trusted & Internet
- Generic Host Process: access to trusted & Internet
- Microsoft Distributed Transaction Coordinator (MS DTC) console program: access to trusted & Internet AND access as a server to trusted & Internet
- Internet Information Services (IIS): access to trusted & Internet
- Windows Management Instrumentation (WMI): access to trusted & Internet

Dos and Don'ts for Setting Up the System

CTX IP Telephones and Strata Net are not compatible with older CTX line cards. If IP Telephones access any of the line cards listed below, the user will experience unacceptable echo return loss and voice quality. For best speech quality we recommend using the appropriate CTX cards for CTX IP telephone connections.

Make sure that you have Printed Circuit Boards (PCBs) that are compatible with CTX R2.0 and higher software and the IP telephones.

- **Do not use –** RCOU1A, RCOS1A, REMU1A (two-wire), RDDU1A, RGLU1A, RGLU2A
- **OK to use** – RCOU3A, RCOS3A, REMU1A (four-wire), REMU2A (two-wire/four-wire), RGLU3A. and RDDU2A.
- **Must use VPN** for remote IP telephones that connect over the Internet with BIPU-M1A.
- With the BIPU-M2A, the IP telephone will now work with DSL and cable routers.

  When connecting remote IP telephones to the BIPU-M2A over the Internet, a VPN router is needed to circumvent Network Address Translation (NAT) and firewall issues by tunneling. Otherwise, the BIPU-2MA must be configured with a public IP address outside the network firewall. See "IPT Anywhere" on page 9-13.

Step 1: Perform a LAN Voice Readiness Assessment

Deploying many IP telephones on a data LAN can have some unexpected pitfalls if the network does not have the bandwidth and speed required to handle VoIP traffic. To prevent delay, jitter, and data loss for VoIP traffic and retain the performance of your other business-critical network applications a network Voice Readiness Assessment should be completed before installing VoIP.

Important! *Voice Readiness Assessments are the responsibility of the installing TSD dealer. Toshiba is not responsible for supporting problems which occur because the network on which the IP telephones are installed does not meet VoIP packet requirements.*

Methods of Estimating Bandwidth Requirements

A "rule of thumb" way to translate voice packet use into worst-case LAN bandwidth requirements is shown below. (This is no substitute for a professional Voice Readiness Assessment).

- When IP telephones use the G.711 CODEC with a packetization rate of 20 millisec. (best voice quality), the bandwidth utilization rounds up to 115K bit/sec. per conversation.
- If the system has 100 IP telephones, multiple 25 simultaneous conversations by 115K bit/sec. for an additional bandwidth requirement of 2.9M bit/sec. on the LAN.

Note The "25 simultaneous conversations" assume ¼ of the IP telephone users are talking at the same time. This scenario is considered worst-case because the best quality CODEC (G.711) is used as apposed to the G.729a which 29Kbps less bandwidth per conversation.

If installing IPTs on your LAN, Toshiba highly recommends downloading "A Handbook for Successful VoIP Deployment: Network Testing, QoS, and More," located at the time of this printing at.http://www.netiq.com/products/vm/whitepapers.asp. Toshiba recommends reading this document and making sure that you have:

- Tested Voice Over IP (VoIP) Call Quality
- Prepared your Data Network for VoIP, considering your needs for bandwidth, equipment upgrades, network architecture, Quality of Service (QoS) and tuning, and classification of traffic considerations.

CAUTION! If installing IP telephones remotely using cable or Digital Subscriber Lines (DSL) Internet Service Providers (ISP) providers, Toshiba recommends setting the telephone to use the G729a CODEC because upstream bandwidth restrictions are usually imposed by the provider. Even if the provider advertises an upstream rate is 128kbs, this bandwidth can still be less depending on traffic conditions.

To assist you in estimating your particular needs, refer to the following diagram that shows typical CTX IP telephone applications.

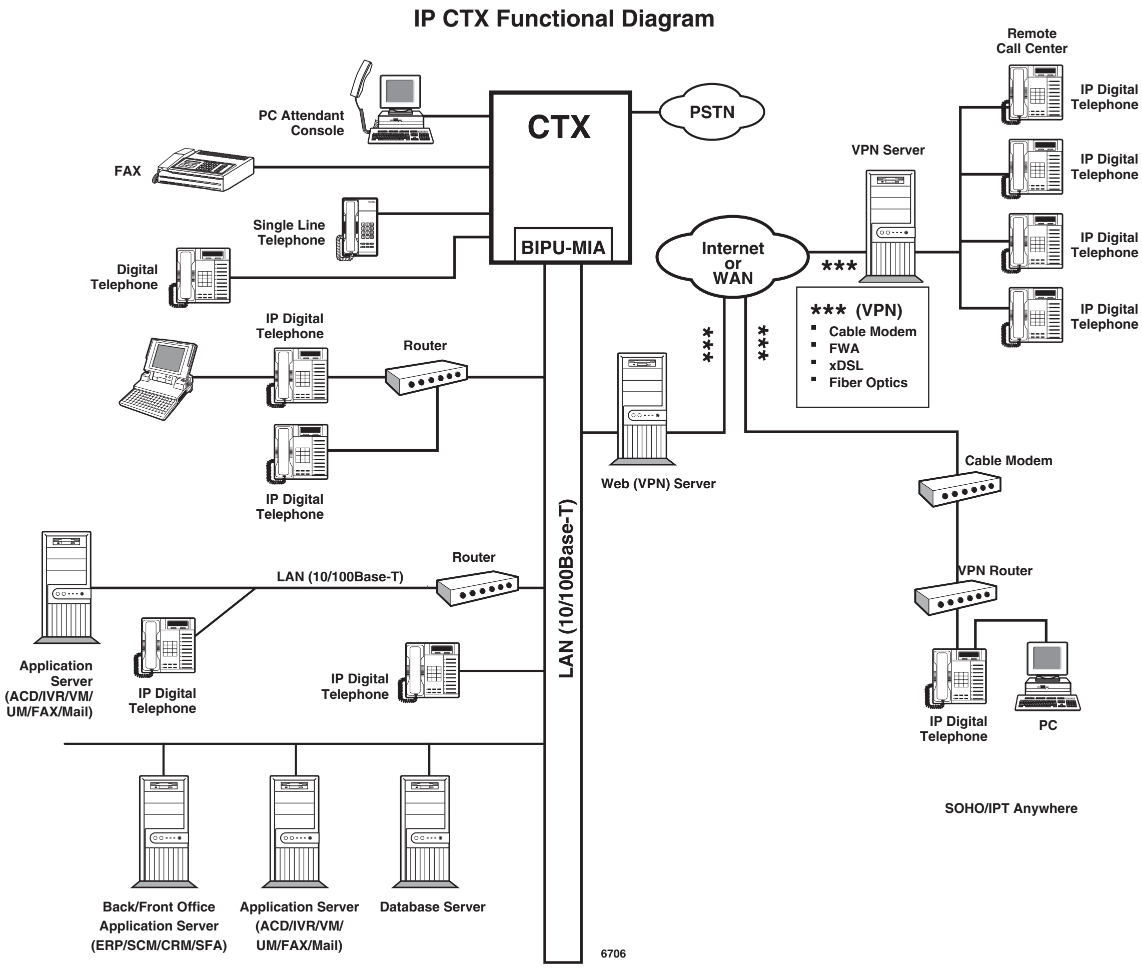


Figure 9-1 IP CTX Functional Diagram

Review Voice Quality Considerations

For best speech quality we recommend not using the older CTX analog line cards for CTX IP telephone connections. If these cards are used, IP telephones will experience fair or bad voice quality. (See “Dos and Don’ts for Setting Up the System” on page 9-2.)

The amount of bandwidth required for communications over a particular IP network segment depends on the number of voice channels supported, the anticipated call setup traffic, and how much other data network traffic is present.

The quality of service (Excellent, Good, Fair, and Bad) provided by CTX IP Telephones and CTX IP QSIG channels depends heavily on the LAN parameters as shown in Table 9-1.

Table 9-1 Quality of Service

IP Network Quality Parameters		Speech			
		Excellent	**Good**	**Fair**	**Poor**
		No one perceives delay.[1]	**Very few people perceive delay.**[1]	**Some people may perceive delay.**[1]	**Many people may perceive delay.**[1]
Latency (Round trip delay)[2]		20ms or less	50ms or less	100ms or less	200ms or less
Jitter[2]		20ms or less (-10 ms ~ +10ms)	50ms or less (-25ms ~ +25ms)	50ms or less (-25ms ~ +25ms)	50ms or less (-25ms ~ +25ms)
Packet loss[2]		1×10^{-3} or less	1×10^{-3} or less	1×10^{-3} or less	1×10^{-3} or less
Packet error[2]		1×10^{-4} or less	1×10^{-4} or less	1×10^{-4} or less	1×10^{-4} or less
CODEC & Packet Interval (Prgs. 250-07, 152-01)	**Bandwidth per channel (Single direction, control channel included)**	**Speech quality per the combination of the network environment described above and the CODEC parameters.**			
G.711 at 20ms	**115kbps[3] (Speech 88kbps)**	Excellent	Good	Fair	Poor
G.711 at 40ms	**99kbps[3] (Speech 76kbps)**	Excellent	Good	Fair	Poor
G.729A at 40ms	**29kbps[3] (Speech 20kbps)**	Good	Good	Fair	Poor
G.729A at 80ms	**22kbps[3] (Speech 14kbps)**	Good	Fair	Poor	Poor

1. Ratings of Excellent, Good, Fair, Poor were based on the tester in a quiet room and the tester could not see the other call party. IPT is usable even with a "Poor" rating if delay is acceptable.
2. When selecting router equipment, the Latency, Jitter, Packet loss and Packet error conditions above should be considered as well as the bandwidth. Bandwidth can be calculated with the CODEC and packet size. For better results, more bandwidth may be required, depending on the amount of overall data traffic. For more details on QoS refer to “A Handbook for Successful VoIP Deployment: Network Testing, QoS, and More” by John Q. Walker, NetIQ Corporation on www.netiq.com.
3. Use this number to estimate the bandwidth needed for the CODEC and interval timing required to achieve an expected Quality of Service (Excellent, Good, etc). This bandwidth includes header and control information and a 25% margin for network traffic variances.

Step 2: Install BIPU-M2A

1. Make sure the BIPS1A is installed onto the BIPU-M2A PCB (see Figure 9-2).
2. Install the BIPU-M2A into one of the following slots:
   - CTX100 Base and Expansion Cabinet slots (1~8, 8 or 16 IPTs per slot per Program 100)
   - CTX670 Base Cabinet slots (1~8, 8 or 16 IPTs per slot per Program 100)
   - CTX670 Expansion Cabinet slots (1~6, 8 or 16 IPTs per slot per Program 100)
3. Follow the procedure in “Worksheet 7 – System Power Factor Check” on page 2-42 to check the cabinet power factor.
4. Power up the system.
5. Program the CTX per the instructions in the *Strata CTX Programming Manual,* refer to the chapter titled “IP Telephone Programming” and “Appendix A – “Applications, Tips, and Tricks.”

Connect BIPU-M2A to LAN or VPN Server

1. Plug one end of a straight-through CAT5/5E/6 LAN cable into the RJ45 Ethernet port on the BIPU-M2A PCB in the CTX. (See Figure 9-2.)
2. Plug the other end of the BIPU-M2A CAT5/5E/6 LAN cable into a LAN or server jack (see Figures 9-8 and 9-9.)

Note The BIPU-M2A or Q1A-switch cables are straight-through cables.

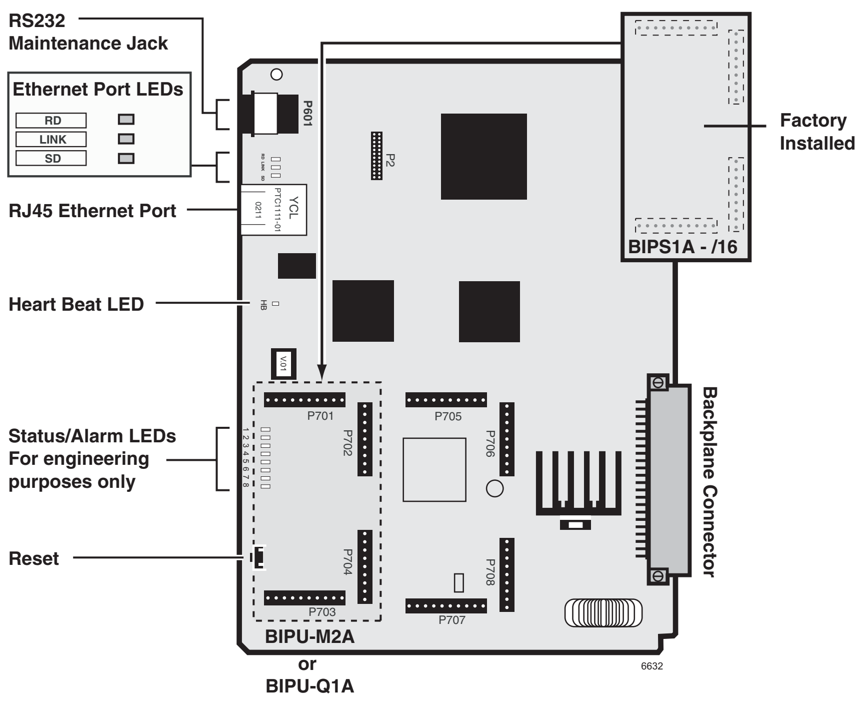


Figure 9-2 BIPU-M2A or BIPU-Q1A PCB ZZ

Table 9-2 BIPU-M2A or BIPU-Q1A Buttons, LEDs and Jumpers

Indicator	Definition
Ethernet Port LEDs	RD - Indicates BIPU-M2A or BIPUQ1A receives data from switch. LINK - Indicates data activity between BIPU-M2A and switch SD - Indicates BIPU-M2A or BIPUQ1A sends data to switch.
Heartbeat LEDs	Flashes at a steady rate to indicate BIPU-M1A or BIPU-M2A or BIPUQ1A is operating normally.
Status/Alarm LEDs	For Toshiba Field Support Engineering use only.
Reset button	Use when requested by Toshiba Field Support Engineer.
RS232 Maintenance Jack	For Toshiba Field Support Engineers only.

BIPU-M2A Interface Unit

System: *CTX100 & 670*
Circuits per PCB: *8 to 16 IPT telephone circuits (programmable)*
Interfaces with: *IP telephones*
Older Version(s): *BIPU-M1A*

The BIPU-M2A PCB interfaces with Toshiba IPT1020-SD telephones only. These telephones operate the same as the DKT3000-series telephones, but do not support Speaker OCA (refer to the *DKT/IPT Telephone User Guide* for operating procedures). The BIPU-M2A has 16 IP telephone circuits (eight or 16 circuits are enabled in Program 100).

The BIPU-M2A supports both G.711 and G.729A standard codec compressions simultaneously. The type of compression used is set independently for each telephone in system programming (see the “IP Telephone” section).

The BIPU-M2A operates on the network at 10/100 Mbps and can be connected to a fast switch router, LAN, WAN, etc. When connecting remote IP telephones to the BIPU-M2A over the Internet, a VPN router is needed to circumvent Network Address Translation (NAT) and firewall issues by tunneling. Otherwise, the BIPU-2MA must be configured with a public IP address outside the network firewall.

BIPU-M2A provides MEGACO+ mobility to enable roaming with Toshiba Mobility Communications System (MCS) applications (available with Toshiba MCS R1.0). The BIPU-M2 enables remote IP telephones to be connected over VPN and non-VPN IP networks.

BIPU-M2A firmware can be updated locally or remotely using CTX WinAdmin. This enables service personnel to update IP equipment with new features and enhancements as they become available. Updates require a brief interruption (a few minutes) of IP telephone operation.

Step 3: Install IP Telephones

Before installing any telephone wiring, read the following warning and caution notes:

WARNING!

- **Never install the telephone wiring during a lightning storm.**
- **Never install the telephone jacks in wet locations, unless the jack is specifically designed for wet locations.**
- **Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.**
- **Use caution when installing or modifying telephone lines.**
- **If telephone wiring exits the building, external secondary protection is required. See Chapter 10 – MDF PCB Wiring.**

CAUTION! **When installing the station cable, do not run the cables parallel if they are within three feet of an AC power line. AC power lines should be crossed at right (90°) angles only. In particular, avoid running station wire pairs near devices that generate electrical noise, such as neon or fluorescent light fixtures.**

CAUTION! **Do not use cleansers that contain benzene, paint thinner, alcohol or other solvents on the telephone's rubber feet. The color of the rubber may transfer to the desk or mounting surface.**

---

1. Install the AC power adapter onto the IP telephone (IPT).

   If using Power over LAN, install PowerDsine unit per the installation manual supplied with that unit.

   The IPT1020-SD must use the AC adapter that is provided with the telephone.

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Important! *To power your Toshiba IPT1020-SD base unit, use only UL Listed AC Adapter Model BADP120-1A (supplied with IPT) Ratings are:*
Input: 120VAC 60Hz, 250mA
Output: 12VDC 1A

2. Use the supplied Ethernet 10/100Base-T (straight-through cable) with an RJ45 connector (eight pin jack) to connect to the telephone LAN jack (see Figure on right).
3. Connect the other end of the telephone LAN cord to the LAN or server (see Figures 9-3 and 9-8.)
4. The IPT operates like a switch, as opposed to a hub, so the IPT can be connected directly to the LAN and then a PC can be connected to the IPT PC jack to make a connection to the LAN.
5. Use the same type of RJ45 cable connector used in the previous step to connect the IPT to the PC.

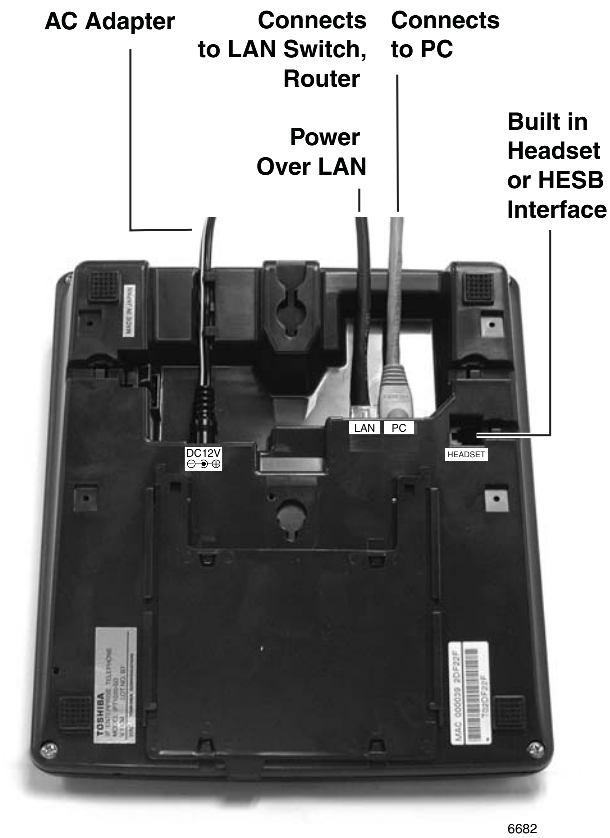


Figure 9-3 IPT Connections

Notes

- A new Add-on Module (ADM) (part number DADM3120) can be connected to the IP telephone. The DKT3000 ADM is not compatible with the IPT. The installation is the same as for the older model DADMs. See "Digital Add-on Module Installation" on page 11-21 for installation instructions.
- For details on other IPT options, see "Power over LAN" on page 9-16. If Power over LAN is used, the AC adapter should not be installed and vice versa.

IPT Operation Notes

The following provides information IPT operation with Strata CTX systems (see Table 9-3).

Table 9-3 IPT1020-SD Operation with Strata CTX

IPT1020-SD Buttons and Features	Strata CTX System with BIPU
Basic LCD	2 x 24 characters
LCD Feature button	Operational
Fixed Spdial button	Operational
IPT1020-SD telephones per cabinet slot	16 telephones max.
Programming Mode "A" (Beep Tone On/Off, etc.) Program Mode "A" is for telephone options that are controlled by the ROM inside the telephone.	Not Operational

Table 9-3 IPT1020-SD Operation with Strata CTX *(continued)*

IPT1020-SD Buttons and Features	Strata CTX System with BIPU
Programming Mode "B" (Flexible Buttons, One Touch, etc.) Program Mode "B" is for telephone options controlled by the Strata CTX670 processor and database memory. (See the *Strata CTX DKT/IPT User Guide.*)	Same as DKT3000 telephones except: • Indication code from center is abandoned. • Keep alive control does not work in terminal setting mode. • IPT does not notify the state of terminal setting mode to Strata CTX.

IPT Telephone Options

A number of telephone option plugs and connectors are built-in to the IPT1020-SD (see Table 9-4 for compatibility).

Table 9-4 IPT Component Compatibility

Item	IPT1020-SD
Add-on Modules	DADM3120 only
Desktop Computer Telephony Interface (CTI)	Future
Speaker OCA	Future
Tilt Stands	BTSD for telephone only and BTSA for telephone with ADM(s)
Headset Interface	Mounted inside.
External Ringer	HESB interface connector is mounted inside.
Cordless Telephones	N/A

IP Telephone Add-on Modules

One or two DADM3120 add-on modules can be connected directly to the IPT1020-SD. Each DADM3120 provides 20 additional feature buttons. The installation is the same as the DADM3020. For instructions, refer to "Digital Add-on Module Installation" on page 11-21.

Tilt Stand Installation

See "Tilt Stands" on page 11-23 for instructions.

External Speaker Unit (HESB) Option

See Chapter 10 – Peripheral Installation for installation instructions.

Handset/Headset Option Straps

The option straps on the IPT telephones must be cut when installing carbon handsets, external power or headsets. Refer to Table 9-5 and Figure 9-4 for further instruction.

Table 9-5 Station Option Interface PCB Compatibility

Strap on IPT PCB	Part No.	Explanation
Carbon	W401, W402, W403, W404	If a carbon-type handset or carbon-type headset is connected to the *handset* jack, four jumper wire straps inside the telephone must be cut.

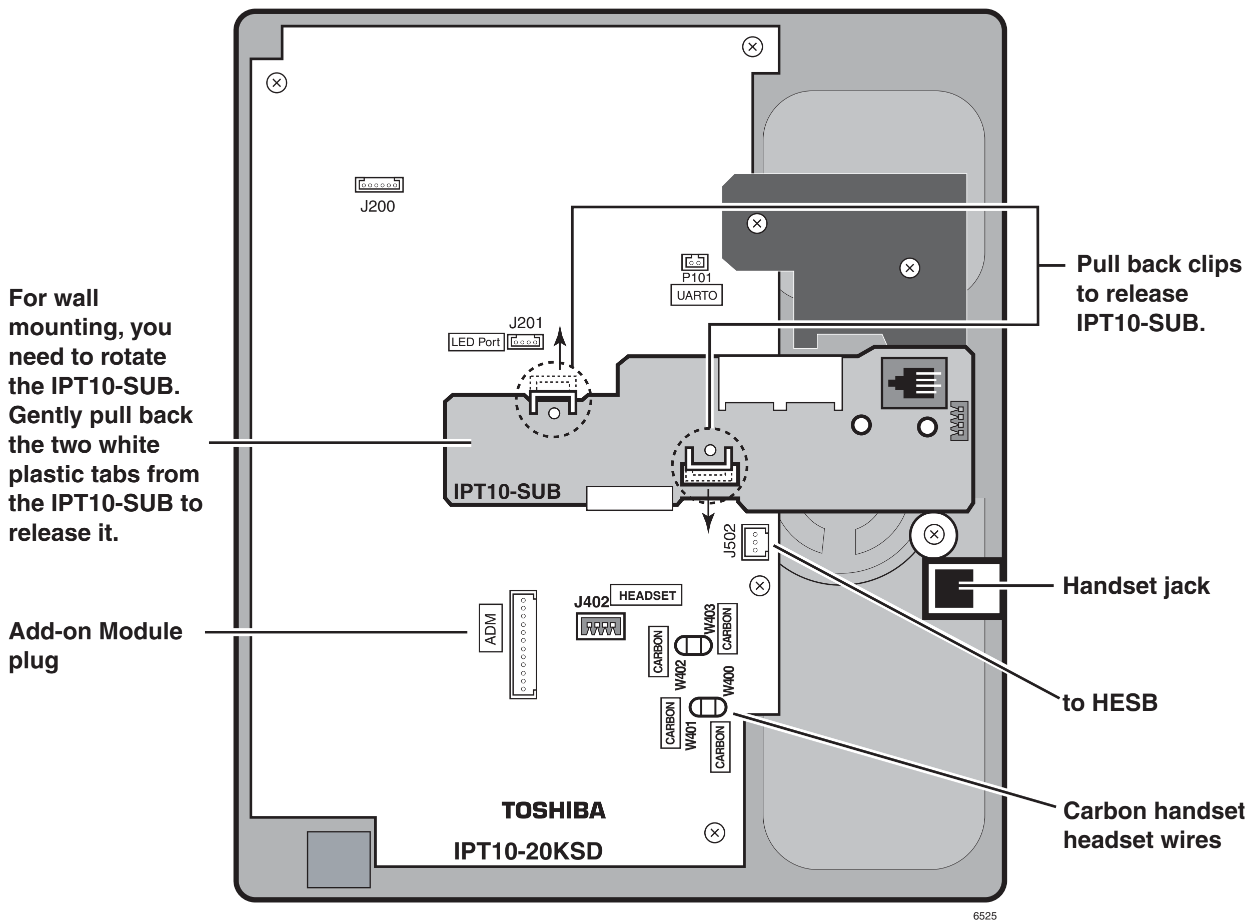


Figure 9-4 IPT1020-SD Strap Connection Location

➤ To wall mount IP telephones

Refer to Figures 9-5~9-7 and the following steps.

1. Loosen the captive screws, and remove the telephone base.
2. Using a suitable cutter, remove the handset hanger from the base.
3. Insert the handset hanger in the slot on the front of the phone. It fits in the notch on the cradle.
4. Carefully remove the IPT10-SUB from the base unit by pulling back the plastic clips that hold it in place (see Figure 9-4).

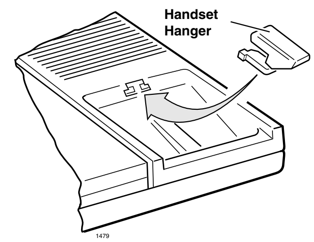


Figure 9-5 Handset Hanger

5. Rotate the IPT10-SUB 180 degrees. Secure it back onto the telephone PCB with the white plastic clips (see Figure 9-6)

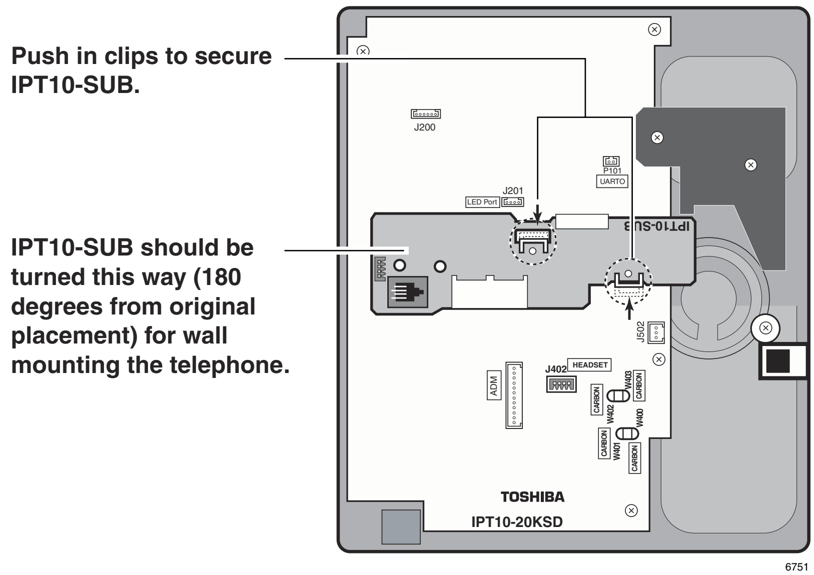


Figure 9-6 Rotate IPT10-SUB for Wall Mounting

6. Rotate the telephone base 180 degrees and secure it to the telephone with its four captive screws (see Figure 9-7)
7. Connect the phone to the wall modular connector with a cord approximately four inches long (available at most telephone supply companies).
8. Route the cord into the hollow portion of the base.
9. Mount the phone on the wall mounting modular connector plate.

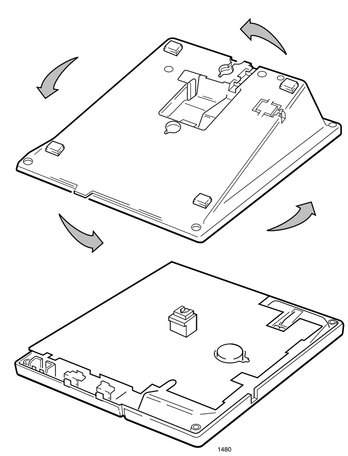


Figure 9-7 Wall Mounting Base Rotation

Step 4: Connect IPTs to Network

The following diagrams are examples of IP connections to either a hub, LAN or VPN network.

IPT Connections

Figure 9-8 shows how the IP components should be connected. Refer to the *Strata CTX Programming manual* for IPT programming procedures.

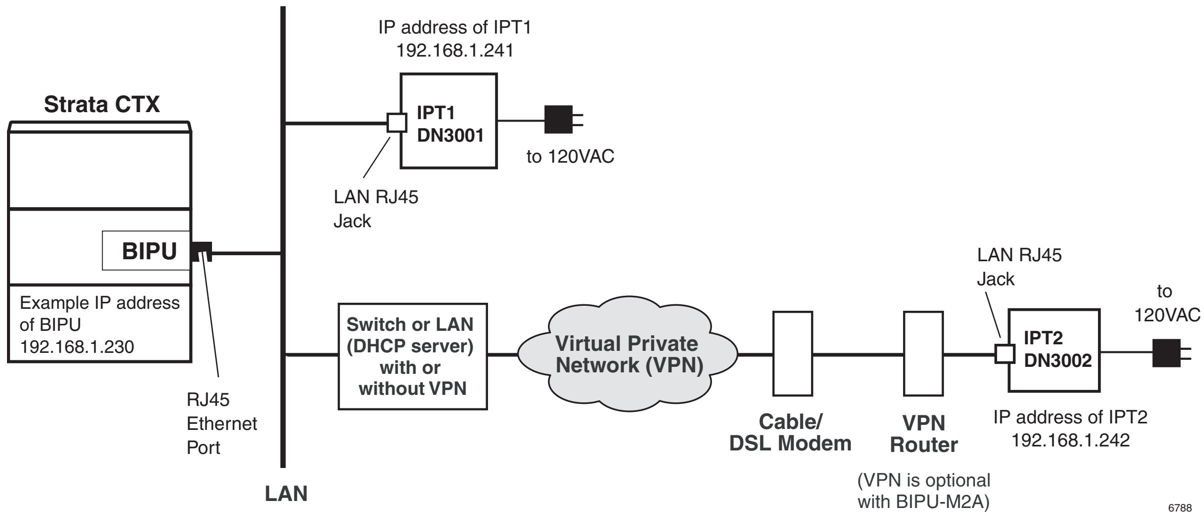


Figure 9-8 IP-CTX Connections Example

IPT Anywhere

IPT Anywhere enables you to connect IP telephones remotely throughout the Internet and use all Strata CTX telephone features (except Speaker OCA). IPT remote connections can be set with or without the use of Virtual Private Network (VPN). VPN connections provide increased security and is recommended for permanent type IPT remote connections. When moving IPT telephones frequently to different locations (hotels, conferences, etc.) non-VPN connections are more practical.

When using home type xDSL or cable connections, only one or two IPTs may be connected because of xDSL and cable bandwidth limitations. High speed T1, fiber, or ATM-type connections are required when installing more than two IPTs at a remote site.

An Internet configuration could use the following connections:

- No VPN, and thus, no security (BIPU-M2A)
- Third party Virtual Private Network (VPN) software residing on DHCP gateway server. To connect IPTs over the Internet, using third party or Microsoft VPN software residing on a DHCP gateway server (see Figure 9-9.)
- ATM (IP over ATM virtualization by VC/VP)
- Broadband Ethernet virtualization by Virtual LAN (VLAN)
- IP-VPN (IP-VPN based on Multi-protocol Label Switching (MPLS)
- Private line connection

- For an access line to link the user's location with the access point of the carrier or provider, using a private line, broadband line (xDSL, CATV), or fiber optics is recommended.

IPT Anywhere enables IPT users working in satellite offices or off-site at home to make full use of the extension features of the CTX IP telephones.

With IPT Anywhere, you should apply the following to prevent deterioration of voice quality:

- **Voice compression** by G.729A is available in Program 250-08 if using more than one IPT or a cable or xDSL connection.
- **Voice attributes** table should be prepared according to the user's "IPT Anywhere" environment and provided to each terminal used for implementing this "IPT Anywhere" environment (Program 152).
- **Priority control** functions supported by BIPU-M2A, IEEE802.1p and Diffserv (Program 150-03) can be applied to the station used for implementing the "IPT Anywhere" environment.

The following picture shows how the VPN components should be connected (see the *Strata CTX Programming manual* for IPT programming procedures).

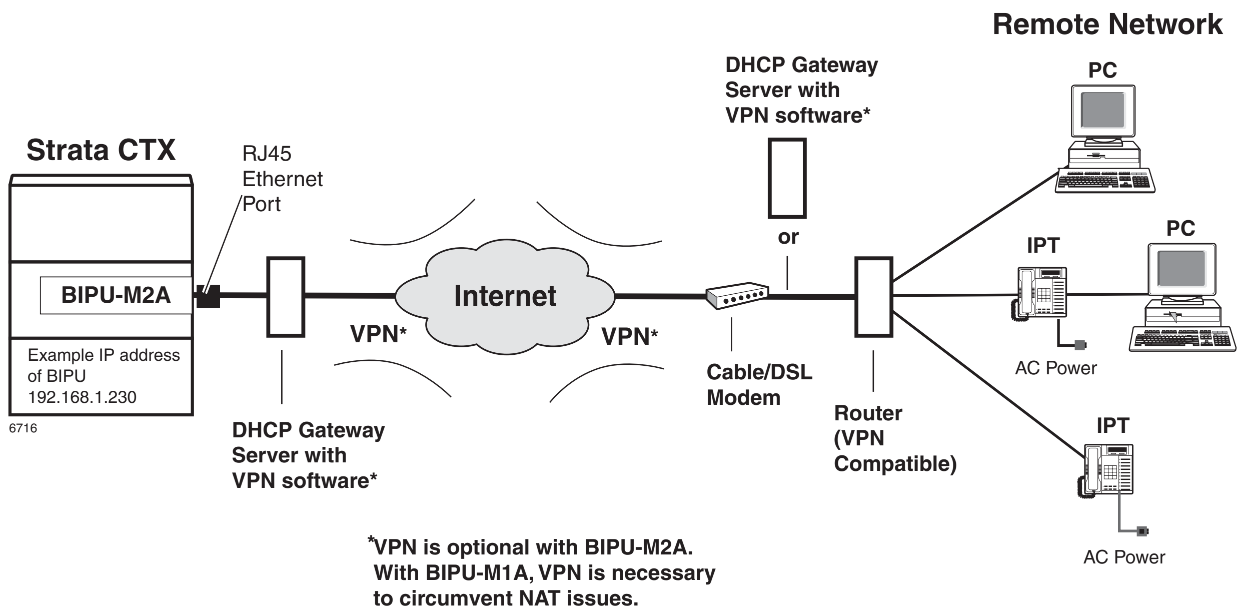


Figure 9-9 IP-CTX Virtual Private Network Connections (Example)

Security Requirements

The terminal authentication using MAC addresses, provides an effective means of restricting the connection of unauthorized terminals in normal LAN environment, is also applicable to "IPT Anywhere" environment. A networked security system is required in a "IPT Anywhere" environment. But by limiting the implementation of "IPT Anywhere" environment to only within an intranet environment, the required level of security can be provided.

The required level of security network can be physically provided with an intranet or by a VPN service provided by the carrier or the provider, since the network will be virtually separated between each contract user of the carrier's or provider's VPN service.

In case of providing services like packet filtering by setting a firewall between the terminal used for the "IPT Anywhere" environment and IP-CTX, you need to prepare an appropriate setting that allows IPT control signals and voice signals to penetrate the packet filter and other features of the firewall.

Addressing

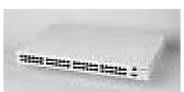
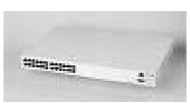
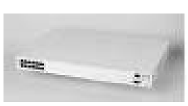
Regarding addressing of IP packets exchanged between IPT and the main system unit, the following restrictions are normally applied.

- NAT (Network Address Translation)/NAPT (Network Address and Port Translation) devices NAT/NAPT devices must not be used for communication between the “IPT Anywhere” terminal and the interface card. The original IP header and UDP header must not be revised.
- VPN Tunneling – By making the private IP address a capsule of the global IP address, the private IP address can be used to tunnel through the global IP network. Using tunneling makes communication between the “IPT Anywhere” telephone and the interface card transparent. Tunneling use requires that the carrier or the provider that the user is in contract with provides a tunneling device or that the user installs his/her own tunneling device separately.
- Address system – It’s important to devise a control system to prevent the private IP addresses of the network for the “IPT Anywhere” telephone and the network to which the interface card installed in this terminal belongs from overlapping.

Power over LAN

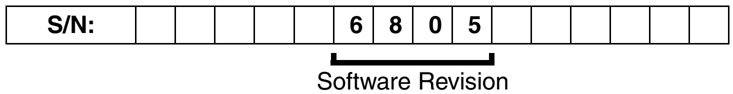
The recommended electric power device by LAN is called Power over LAN™ from PowerDsine, Ltd. http://www.powerdsine.com. Compatible models are shown in Table 9-6

Table 9-6 Power over LAN Models

Port Models	Model Name	Input	Output
24 port type 	PD-PH-6024/ACDC/48	AC input Voltage: 88 – 264 VAC AC Frequency: 47 – 63 Hz DC input Current: 10A at 48 VDC	Output Voltage: -48VDC User Port Power: 16.8W (Maximum) Data Rates: 10/100 Mbps
	PD-PH-6024/AC/48	AC input Voltage: 88 – 264 VAC AC Frequency: 47 – 63 Hz	
12 port type 	PD-PH-6012/ACDC/48	AC input Voltage: 88 – 264 VAC AC Frequency: 47 – 63 Hz DC input Current: 10A at 48 VDC	
	PD-PH-6012/AC/48	AC input Voltage: 88 – 264 VAC AC Frequency: 47 – 63 Hz	
6 port type 	PD-PH-6006/ACDC/48	AC input Voltage: 88 – 264 VAC AC Frequency: 47 – 63 Hz DC input Current: 10A at 48 VDC	
	PD-PH-6006/AC/48	AC input Voltage: 88 – 264 VAC AC Frequency: 47 – 63 Hz	

Note Toshiba does not supply the Power over LAN units. When you order the Power over LAN model from PowerDsine, please indicate that you need the Power over LAN that can support the Toshiba IPT1020-SD Some models don’t support the IPT1020-SD.

Be sure to order the PowerDsine products (PD-6000 product family) from a software revision that is equal to 6805 or higher (produced from March 15, 2003). The software revision numbers appear in the position shown below on the serial number label.



An example of a typical IPT-CTX connection using a PowerDsine Power over LAN unit is shown in Figure 9-10.

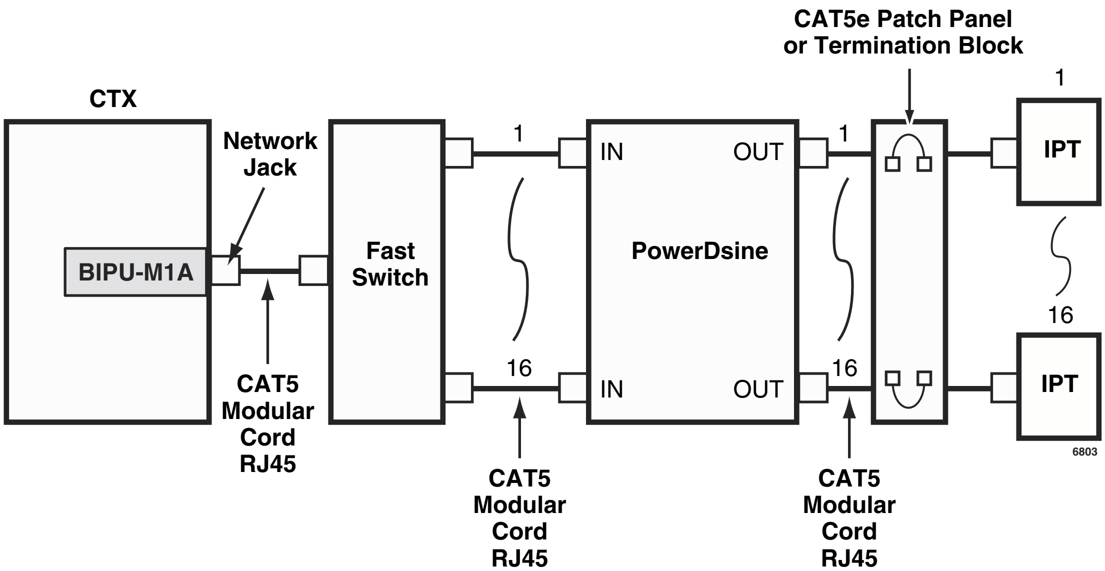


Figure 9-10 Typical IPT-CTX Connection Using PowerDsine Power over LAN Unit

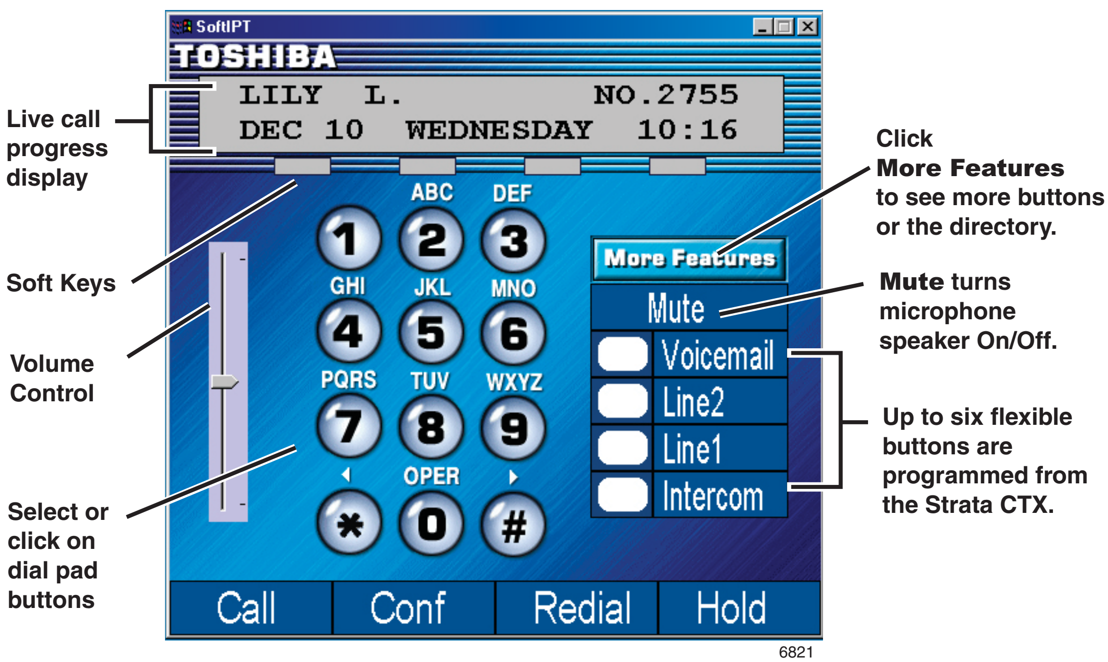
Installing and Operating the SoftIPT

This section explains how to install and operate the Toshiba SoftIPT™. It also discusses how the SoftIPT will work on wireless 802.11 networks.

The SoftIPT is a software phone client that runs on wired or wireless laptops, tablets and desktop PCs with the Microsoft® Windows XP® operating software.

The SoftIPT enables true mobility with access to voice mail, programmable feature buttons, and a directory that works with Microsoft Outlook® 2002. And because it's wireless, you can access Internet services on the same PC.

The main SoftIPT GUI is shown below.



Hardware/Software Required

The SoftIPT works with the Strata CTX100-S, CTX100 and CTX670 telephone systems with CTX R2.1 MG020 or higher.

SoftIPT operation requires a wired or wireless 802.11 connection over the IP network (Internet, WAN, LAN, etc.) to the CTX BIPU-M2A or BIPU-M1A PCB with firmware version 07e or higher IP interface. The voice communications uses the MEGACO+ protocol for call control signaling and RTP for voice transmission.

Note The SoftIPT can work on wireless 802.11 networks (see “Application Notes for Wireless 802.11 Networks” on page 9-26 for more information).

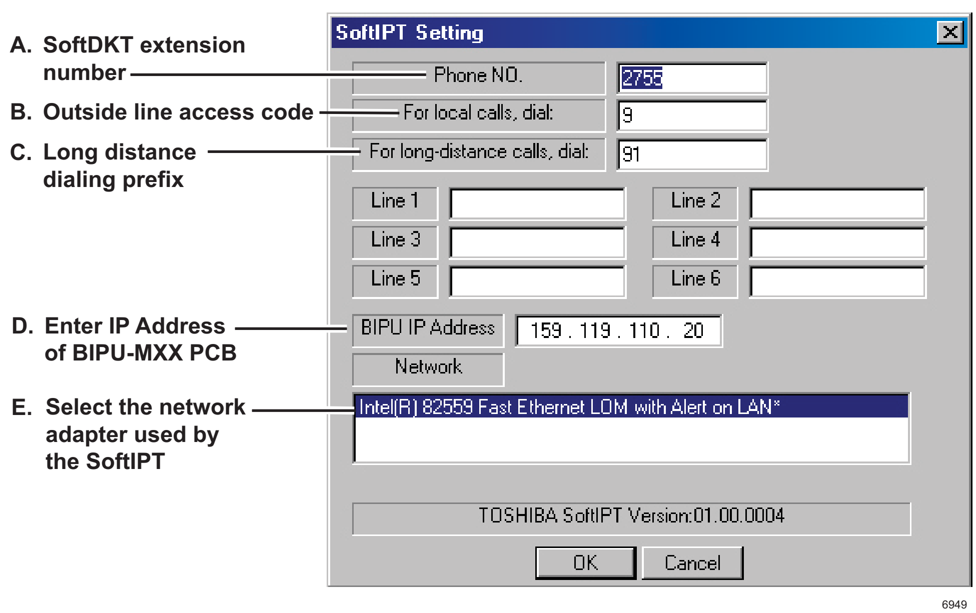
A user can install the SoftIPT on a laptop, tablet or desktop PC at the same time, but each should have a unique station ID and license. The SoftIPT works with desktop or laptop PCs with Windows XP, or higher, operating system (OS).

Access points are required for wireless systems. Customers must supply their own access points and headphone/microphones. The SoftIPT requires the use of a headset. Without the headset, the far end of the conversation will hear the echo caused by the laptop's built-in microphone picking up the output of the speaker.

The SoftIPT Graphical User Interface (GUI) has fixed and flexible buttons. Fixed buttons cannot be changed (Intercom, Mute, Voicemail, Directory, Settings, Call Log and Help). Flexible buttons can be assigned different features and labels.

Before You Begin

Important! *See the illustration below. You will need to enter items A~E during the installation process. Check with your Telephone System Administrator to make sure that you have this information. After entering this information, we suggest that you print this screen for future reference.*



Note Changing button labels “Line 1” ~ “Line 6” is optional. You can change these labels, but it does not change the button function. See “Labeling Feature Buttons” for details.

Step 1: Install SoftIPT

Follow these instructions to install the SoftIPT on a tablet, laptop or desktop PC.

1. Insert the SoftIPT CD-ROM into your CD-ROM drive.
2. From the Main Menu, select “Install SoftIPT.” The InstallShield Wizard performs “Preparing to Install.”

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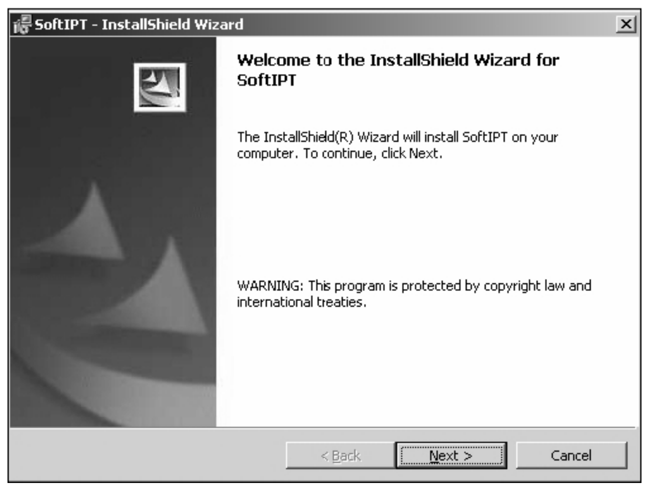
3. In the Welcome window (shown right), click Next.
4. Read the TAIS TSD License Agreement, select “I accept the terms in the license agreement,” then
5. click Next to continue.
6. In the Customer Information screen, click Next.
7. In the Destination Folder window, click Next.
8. In the Ready to Install the Program window, click Install.
9. Click Finish to exit the Wizard.



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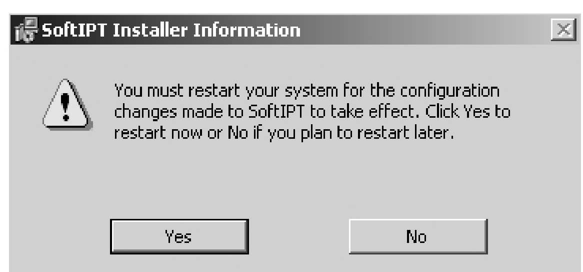
10. At the Restart window (shown right), click Yes, unless you want to restart at another time.



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11. In the Softphone Setting window (shown under "Before You Begin" on page 9-19), enter the following:
    - SoftIPT extension
    - Outgoing Prefix (outside line access code, if required)
    - Long Distance prefix
    - IP address of BIPU-MXX (xx = version number). See your System Administrator for this address
    - If there are multiple network adapters, select the one for SoftIPT.

Note Changing button labels "Line 1" ~ "Line 6" is optional See "Labeling Feature Buttons" on page 9-24 for details.

12. Click OK. If requested to enter an integer, make sure you have entered a phone extension or area code. From the SoftIPT main screen, click the "X" in the upper right corner (exits the SoftIPT application).
13. Double click on the SoftIPT icon to restart the SoftIPT.
14. Plug in your headset. The next two steps are guides to adjusting the microphone/headset volume.
15. Select Start > Control Panel > Sounds and Audio Devices.
16. On the Voice tab, click Volume. Adjust the Microphone volume. Click Advanced. Make sure all check boxes are off and set MIC volume to 90% high. Select OK. The SoftIPT is ready to use.

Upgrading the SoftIPT

1. Close the SoftIPT application if you are using it.
2. Insert Strata CTX CD-ROM into your CD-ROM drive.
3. Double click on SoftIPT-PCInstaller.exe. The SoftIPT - InstallShield Wizard runs. You will be prompted to select upgrade, repair or remove the program.
4. Click Upgrade or Repair.
5. Click Finish to exit the Wizard. Your SoftIPT is upgraded.

Step 2: Start the SoftIPT

➤ On a PC, double click on the SoftIPT icon on your PC desktop.

Making a Call

The Toshiba SoftIPT integrates the power of a PC with all of the features available on a DKT3000-series telephone, except background music. The main difference is that you use a mouse or stylus to select buttons.

Other than these few differences, you can use most of the features described in the *Strata CTX DKT/IPT User Guide*, available on the Internet FYI site, Documentation > User Guides. Refer to this guide for instructions on using the other features.

➤ **To make a call**

1. Click `Call`. Hear dial tone.

   (If you have “hot dialing,” skip this step. Click on a button on the dial pad and if you hear dial tone, you have “hot dialing.”)

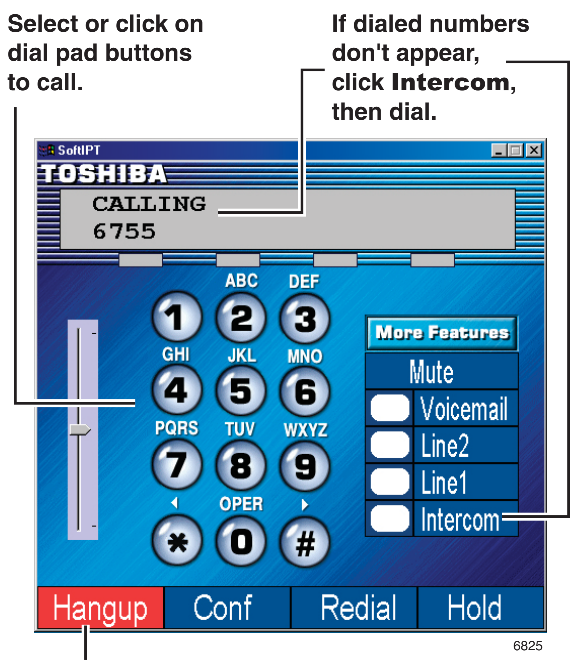
2. Click or select the on-screen dial pad buttons to dial a call.

   ...or if the dialed numbers don’t appear on-screen, click `Intercom`, then dial by clicking on the dial pad buttons on-screen.

3. When connected to a call, you can select any of the call buttons, such as `Hangup`, `Redial`, `Hold` or `Conf`.

4. Click `Hangup` to end the call.

Note Do not use BGM (#490) on the SoftIPT. It conflicts with incoming calls.



When you are on a call, the **Call** button changes to **Hangup**. Click **Hangup** to end the call.

Switching a Call to Your Headset

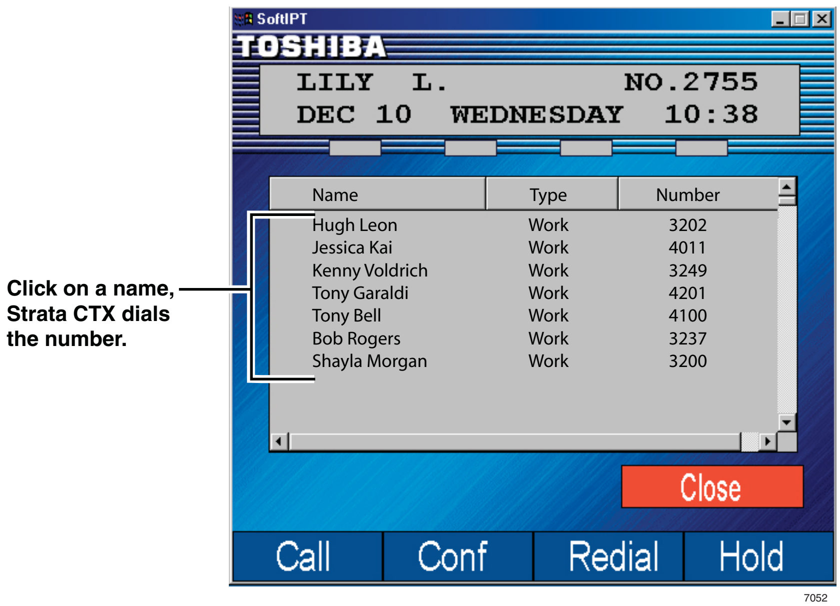
You can switch a call from your DKT3000- or 2000-series digital telephone to the SoftIPT by placing the call on Hold and using the Call Pickup feature.

1. Press `Hold` on your digital telephone.
2. On the SoftIPT, dial `#5#72` + the extension number of your digital telephone.

Creating a Directory

You can create a directory with Microsoft Outlook 2002 (not Outlook Express).

1. Open Microsoft Outlook 2002.
2. Double click on the Contacts icon, click on the New contact icon.
3. Type in the contact information, click Save and Close. Add as many entries as desired. To edit an entry, double click on the name to open.
4. Open the Soft Phone.
5. Click `More Features` twice, click `Directory`. The directory displays (see below).



Using the Directory to Call

➤ Click on the name. The SoftIPT calls the contact.

Labeling Feature Buttons

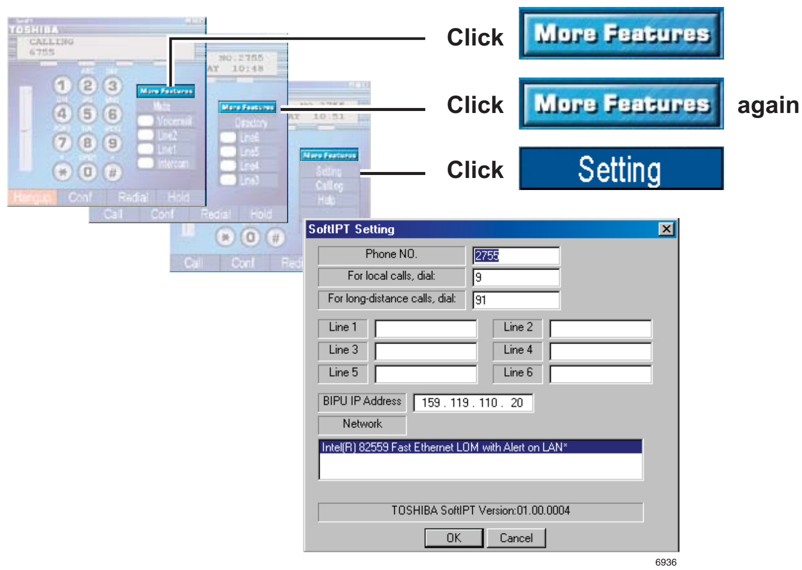
From the Softphone Setting window, you can change six of the telephone button labels. Changing the label does not change the function. To change the function, see "Programming Feature Buttons" in the *Strata CTX DKT/IPT User Guide.*

➤ To find out what features are assigned to the feature buttons

1. Dial #9876 to enter user programming mode.
2. Click on HOLD, then click on the feature button.

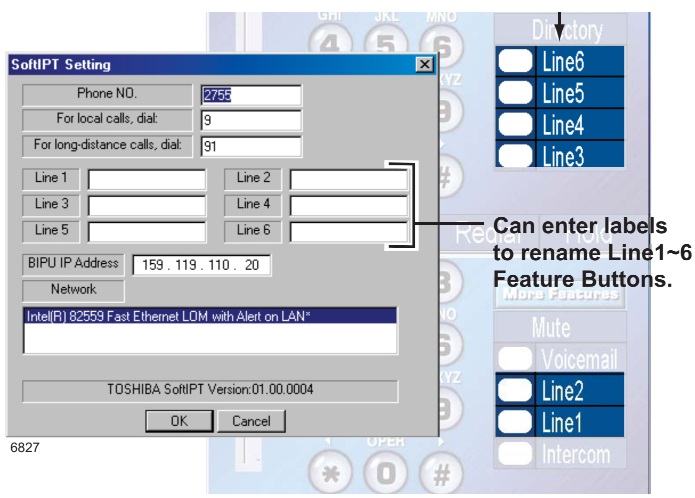
➤ To change Feature Button Labels

1. Click More Features twice. Click Setting.



Softphone Setting window opens.

2. From the Softphone Setting window (shown right), type in button labels (eight characters max.), click OK.
3. Click the "X" in the upper right corner to shut down the SoftIPT. Your changes won't appear until you shut down and restart the SoftIPT.



4. Click on the SoftIPT icon to restart. The new button labels will display.

Note If you reprogrammed the button functions per the instructions in the user guide, you cannot manually exit from "programming mode." Just wait a few seconds for the system to time out and the SoftIPT will return to idle.

Using the Call Log

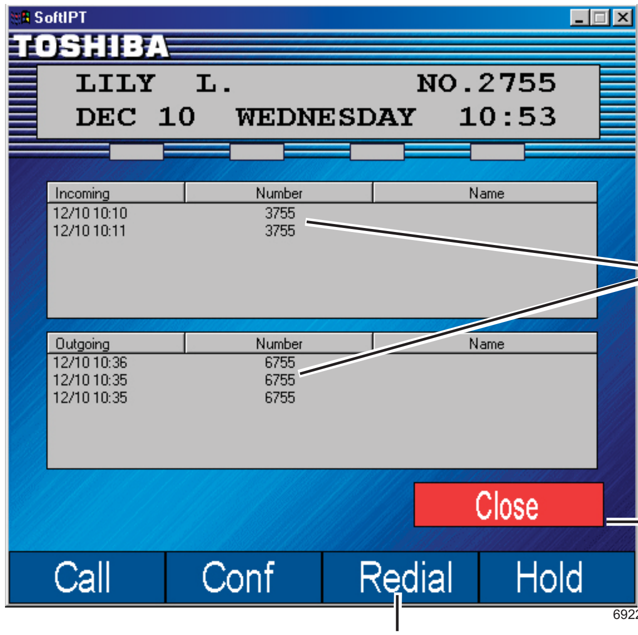
The SoftIPT keeps a log of incoming and outgoing calls.

➤ **To access the Call Log**

1. Click More Features until you see the Call Log button.
2. Click Call Log. The log displays (shown right). From this screen, you can:
3. Click Redial to dial the last outgoing number

   ...or click on an incoming or outgoing number to dial it.

   You can click Close to close this screen and return to the dial pad to enter an access code or to access the Mute, Voicemail, Directory or other buttons.



Click on an incoming or outgoing number to dial it.

Click Close to return to the dial pad.

Click Redial to dial the last outgoing number.

Uninstalling the SoftIPT

➤ **To remove SoftIPT from your PC**

1. Click on Start > Control Panel > Add or Remove Programs.
2. Select SoftIPT, click Remove.

➤ **To remove the SoftIPT folder, select Start > Programs > File Explorer.**

➤ Select My Documents > My Device > Program File > Toshiba > SoftIPT, then select Delete.

Application Notes for Wireless 802.11 Networks

The Toshiba SoftIPT™ works on wireless 802.11 networks. However, current access point technology does not provide for the management of quality of service over the wireless network, which can result in a few observable degradations in voice quality.

Our objective here is to describe these issues for the network engineer, and offer some recommendations. As the technology evolves, and the knowledge base grows, other problems and solutions will emerge, hence the network engineer is encouraged to search out other sources of information, from the specific access point manufacturers or from experts in the 802.11 wireless industry.

Possible problems and their implications are:

1. Dropped packets may occur due to RF signal strength, especially as you get further away from the access point. When small amounts of packet loss occur, you will notice a popping or clipping sound. With larger amounts of packet loss, gaps in the conversation will occur. This is very similar to the behavior of digital cell phones in the same situations. The best way to deal with this is to design the wireless network for good coverage where it is needed.
2. Dropped packets may also occur due to excessive traffic on the wireless network. With multiple devices accessing data through the same wireless network, current access points do not have a method for prioritizing voice packets over data packets so when data applications create more traffic than the wireless bandwidth can sustain, voice packets may get dropped. In addition, access points do not have a mechanism for limiting the number of simultaneous sessions. In our lab we find that up to seven calls can take place simultaneously on a single access point. This number will vary depending on the access point, the RF environment, and any other activity in the wireless environment.
3. When one terminal is in a poor signal area for the access point that it is associated with, the access point may automatically reduce its data rate in order to achieve better communications with that terminal. This new data rate affects communications with all terminals, which will reduce the number of simultaneous calls the access point can support. Network engineers should consider whether they want to disable the Auto TX Data Rate Feature.
4. Disconnected calls will result if you move too far away from the access point, or generally are in a poor signal strength area. With current 802.11 wireless technology, when a terminal can’t communicate with an access point, it will disassociate with it. This appears to the phone application as a loss of the network, and the phone application disconnects. Even if you quickly move back into range of an access point, it will take several seconds for the 802.11 terminal to detect and re-associate with the access point.
5. Wireless networks can only get so large, before you have to break them up into multiple subnets. Somewhere between 256 and 1000 nodes is where networks begin to need to be broken up into multiple subnets. When multiple subnets are employed, the call will get dropped as the terminal gets out of range of its subnet. But the terminal can reestablish its call after associating with the new subnet.

FYI: At Toshiba we are working on technology to address problems 2~4 for the SoftIPT. Check back with us.

Wireless Recommendations

Follow these recommendations when using the SoftIPT on a wireless network.

- Ensure that no more than seven SoftIPT clients are working through a single access point at one time.
- Engineer your wireless network so that there is good signal strength everywhere wireless terminals will be used.
- Use the ping program to test your wireless network. In Microsoft® Windows® perform the following:
  1. Select Start > Run.
  2. Type **`command`**, click OK.
  3. At the prompt, type **`ping ñt ñl160 ñw250`** (BIPU IP address, such as **`159.119.112.32`**) and press Enter.

     This starts the ping program and sends packets to the BIPU. **`ñl160`** makes the packets the same size as a 20msec. voice packet, and the **`ñw250`** says if there is no response in 250 msec., then the packet dropped. Periodically you can press **`<Ctrl><Break>`** keys and see the packet loss statistics. Packet loss ratios of 1% or less can be considered acceptable This tool provides quantitative results that can be used when trying to engineer the wireless network.
- Employ a channel allocation strategy. 802.11b supports multiple data rates, from 1Mbps up to 11Mbps. At 11Mbps – the objective of most networks these days, access points that are less than five channels away will interfere with each other. This would mean that access points must be on channels 1, 6, or 11. Some wireless network engineers have suggested that using channels 1, 4, 7 and 10 would provide a very important fourth channel, and have minimal interference.
- Check your environment for other access points and other equipment operating in the 802.11 band. There are many programs available that will allow you to identify access points within reach of the terminal running the program. One example is Network Stumbler (this is not an endorsement or recommendation of a particular product). Also consider that some cordless phones operate in the same 2.4GHz band as 802.11b.

Considerations

To get the best use from your SoftIPT, consider the following tips.

- Use a headset with an attached microphone to provide good call quality and privacy. If you don’t use a microphone/headset, the called party will hear an echo.
- When you are not wearing the headset, unplug it so that you can hear the phone ring. When the headset is plugged in, you can only hear ringing through the headset.
- Use Microsoft Outlook 2002 to create contacts. The SoftIPT does not work with Outlook Express.
- Dialing tips: When you click or select buttons on the SoftIPT, you will not hear button tones. Also, you must use the SoftIPT directory, keyboard or dial pad buttons to call another number. The SoftIPT does not recognize numbers that you “copy” and “paste” onto the screen.
- If you minimize the SoftIPT, incoming calls “pop up” the SoftIPT to the foreground. If you want the SoftIPT to “pop up” for incoming calls, always minimize it after each call.
- The SoftIPT disconnects immediately after the called party hangs up. If you select the `Hangup` button and it turns back to the `Call` button, it means that the other party disconnected first.

- The `Conf` button works the same as the `Cnf/Trn` (Conference/Transfer) button on the DKT/IPT telephones.
- You can make a Windows “shortcut” and add it to your program menu or add it as a Quick Launch item using the standard Windows method. The SoftIPT application does not automatically do this.
- When you exit the SoftIPT, any Call Forwarding that you set also turns off.
- Make sure that you are running only one version of the SoftIPT. If you click on the shortcut icon or start the program while you are already running it, another SoftIPT application will open. If you see “Searching BIPU...” or “Can’t Register SoftIPT” click the close button to make sure that there isn’t another SoftIPT running.
- If you are on a SoftIPT call and you are viewing the Setting window, select Cancel to exit the Setting window. Avoid selecting OK during a call, since it will reset the SoftIPT and the call. The application will operate with the new Setting information after you start the SoftIPT again.
- The Call Log does not record calls that have a name associated with it. It logs calls that are stored on the Strata CTX as a number.
- For the SoftIPT, configure the Strata CTX BIPU PCB for G.711 CODEC at 20msec. (40msec. voice packet transmission interval is not supported and G.729 is not supported.)

Note Quality of Service statistics are not available on Strata CTX for the SoftIPT.

Tested Platforms

The following devices and PC platforms have been tested with the SoftIPT.

Audio Devices

- YAMAHA AC-XG, ALi Audio Wave, or Analog Devices (ADI)

PC Platforms

- Portege 3500, 1.3GHz, 256MB, “ALi Audio Wave,” Windows XP pro
- Satellite 5200, 2GHz, 512MB, “YAMAHA AC-XG WDM Audio,” Windows XP pro
- Satellite Pro M10, 1.6GHz, 512MB, “SoundMAX Digital Audio,” Windows XP pro
- Tecra S1, 1.5GHz, 512MB, “SoundMAX Digital Audio,” Windows XP pro

CTX IP Troubleshooting

This section provides guidelines for troubleshooting the CTX with IP. It covers the kind of data to collect for troubleshooting and how to collect it. Toshiba TSD Technical Support will require collecting data for diagnosing problems.

IP Telephone Ping Test

The IPT sends 10 ping packets of 64 bytes. The time lapse between ping packets is one second. The time that the IPT waits for a reply is five seconds. When the IPT receives the reply packet within five seconds, the counter which shows received packets increases in number.

1. Press 3, 6, 9 and Hold simultaneously.
2. Press 2 Hold to select the Network Setting Mode. Refer to the following table to continue with the test.

Table 9-7Ping Test

Action	LCD Indication		Remarks
1. Press FB15.	IPT changes into a network diagnosis mode.	**LOOP BACK MODE**	
2. Press 1.	IPT is ready to send ping packets.	**PING TO BIPU**	
	In case the IP address of the IPT is not set (processing DHCP).	**PING TO BIPU CAN'T GET IPT ADDRESS**	It is impossible to execute ping when IP addresses of IPT and BIPU are not set.
	In case the IP address of BIPU is not set (executing RAS).	**PING TO BIPU CAN'T GET BIPU ADDRESS**	
3. Press Hold.	Ping packets are sent and IPT displays the number of received and sent packets.	**PING TO 172.16.36.100 PING RESULT 5/5**	When the IPT sends ping packets, it displays the IP address of BIPU on its LCD. The display format is "Number of received packets/number of sent packets."
	After sending 10 ping packets, IPT displays new result.	**PING TO 172.16.36.100 PING RESULT 10/10**	If you operate off-hook and on-hook while ping is executing, the ping is stopped and changes to normal mode.
4. (Optional) Press 2.	The sending of ping packets is stopped.	**STOP PING EXECUTING 5/5**	The counter is continuously increased during the sending of the packets.
5. (Optional) Press 3.	Previous result is displayed.	**PING TO 172.16.36.100 PING RESULT 10/10**	
	If ping is not executed, the LCD displays the following:	**PING TO BIPU PING RESULT 0/0**	

LCD Network Failure Displays

When LCD Network failure occurs between BIPU and IPT, IPT displays one of the following LCD messages.

Table 9-8LCD Network Failure

Conditions	LCD Indication	Remarks
1. Failed in TCP connection with BIPU.	BIPU TCP CONNECT ERROR	When this LCD message appears, IPT resets after 10 seconds.
2. Cut off TCP connection with BIPU.	BIPU TCP PORT IS CLOSED	
3. Keep alive error (DCH data from BIPU was stopped 20 seconds or more.)	BIPU ALIVE PACKET STOP	

Collect CTX Trace Data on CTX SmartMedia Card

The Trace Data consists of an EventTrace, Error Log, Admin Log, and ProgData.The procedure is provided in the *Strata CTX Programming Manual*.

Collect BIPU Logs

1. Connect to PC by RS-232C cable and launch a terminal emulator software (Hyper Terminal, ProCom, etc.). See Figure 9-11.

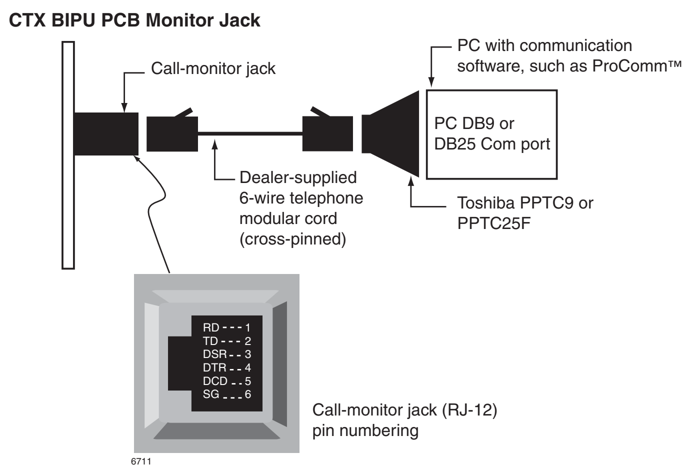


Figure 9-11 BIPU Monitor Jack

Serial port setings:

- Baud rate: 9600
- Data: 8 bit
- Parity: none
- Stop: 1 bit
- Flow control: none

2. Log onto the BIPU. At “A.B.C.D login:” prompt, type **`root`**

   A.B.C.D login: **`root`**

   (*) A.B.C.D: BIPU IP address programmed in Program 151-FB01.

3. Display the log files and put them into the text file.

   `# cat Log0.log`

   `# cat Log0.err`

   (*) Log0.log contains the all contents of Log0.err.

Check Log0.log/Log0.err for Error Message Output

The format of error message is:

Date Time E module-name:error message ex

2003/02/13 17:39:49:340 E CBipulo:Reboot:vp init

➤ Display the kernel boot message and put it into the text file **`# dmesg.`**

Check Whether Message Associated Warnings/Errors Were Printed

BIPU Reset

➤ If the BIPU resets, find the text string with the implied reset cause.

Table 9-9 BIPU Reset Causes

Reset cause	String in the Log file	Known conditions
Software Reset	Called CPU reset	DSP hardware initialization was failed or timed out.
		DSP command execution was failed or timed out.
		Any internal process was dead.
		Modify the network configuration (IP address, etc.)
		BIPU program update
WDT Overflow	WDT Timer Overflow	DSP lock
		BIPU is overloaded with network traffic.
Hardware WDT (PM only)	--	CPU lock
Others	--	--

Verify CTX/BIPU/IPT Hardware, Software and Firmware Version

Mandatory Data

Which	What	How	Example
CTX	Software	Program 901 FB1	NA200MF010, SA200MF009
BIPU	Hardware	Labeled on card	CM4, CM5, PM
	FPGA	Labeled on chip	V.03, V.04
	Firmware (BootRom version included)	Program 151 FB4	BIPU10A, BIPQ02B
BIPS	Hardware	Labeled on card	CM3, CM5
IPT	Hardware	Labeled on base	CM9
	Firmware (BootRom version included)	Program 250 FB9 or Terminal Setting Mode	DIP11PA, DIP11QB

Optional Data for Program Update

Which	What	Example
FTP	Operating system	Windows XP server, RedHat Linux
	Server program name	IIS, wu-ftpd, CTX internal
	TCP/IP properties	IP address, netmask, gateway address
WinAdmin	WinAdmin version	V1.30, V2.00
BIPU	Target BIPU firmware version	BIPU11B
IPT	Target BIPU firmware version	DIP11QB

CTX System Configuration

In the following record sheets, record the card configuration for the cabinet where the BIPU is installed. Include the following information:

- Mark the BIPU slot.
- Input card type based on Prog100 --> upper space
- Input installed card information when the problem was occurred. --> lower space
- Card information:
  - card type
  - hardware version (CMx, PM)
  - firmware version
- In addition, the version of processor board, cabinet and power unit.

CTX670										
Slot	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Base										
Exp.										

CTX100									
Slot	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Base/ Exp.									

Network Information

Network Equipment that BIPU/IPT Directly Connects To

- Switching Hub (Layer2 Switch) Port
- Repeater Hub Port
- Router Port
- Layer3 Switch Port

Acceptable settings are shown in the table below.

Equipment type	Link speed			Mode			Vlan, Priority			Routing protocol			
	10Mbps	10/100Mbps	1Gbps	half duplex	full duplex	auto	IEEE802.1p	tag vlan	port vlan	static	rip	igrp/eigrp	others
Repeater Hub					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Switching Hub										N/A	N/A	N/A	N/A
Router													
Layer3 Switch													

Network Diagram

Sketch the simple network diagram.

Capture Packets

Packet types to be captured are:

Protocol Name	Type	Use, Purpose
RAS (H.225)	udp	for searching BIPU and registering IPT with the system
MEGACO+	tcp	call control protocol
RTP	udp	carry the voice data
RTCP	udp	control RTP System uses this protocol to measure the round-trip delay of rtp packets between BIPU and IPT (currently unavailable).
SNMP	udp	get/set CTX data from CTX WinAdmin
FTP	tcp	to download updating file when updating the BIPU/IPT program.
FTP-data	tcp	to download updating file when updating the BIPU/IPT program.
DHCP	udp	request to lease an IP address (IPT only)
IP-QSIG	tcp	encapsulate QSIG message over IP network

The following is the port number used by each protocol. This is useful for filtering captured data.

RAS (Registration, Admission and Status)

	IPT	BIPU
Discovery (GRQ, GCF, GRJ)	1718	1718
Registration (RRQ, RCF, RRJ)	1719	1719

MEGACO+

IPT	BIPU
random	2944

RTP/RTCP

	IPT	BIPU
RTP	1500	X (11000 – 13000). Always an even number.
RTCP	1501	X+1. Always an odd number.

FTP/FTP-data

	BIPU (FTP client)	FTP server
FTP	1024 (initial) 1026 (retry)	21 (well-known)
FTP-data	1025 (initial) 1027 (retry)	20 or any port (Depends on server implementation)

DHCP

DHCP server	DHCP client (IPT)
67	68

Capture Points

The capture point for the BIPU and the IPT are shown in Figure 9-12.

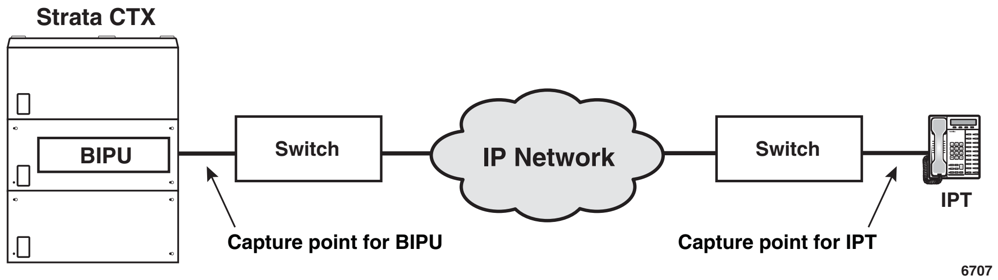


Figure 9-12 Capture Point Locations

How To Capture Packets

Using Repeater Hub (Dumb Hub)

If you want to use a repeater hub (dumb hub) for troubleshooting, it should be connected as shown in Figure 9-13.Toshiba does not recommend the use of the repeater Hub to be unable to ensure the voice quality. A repeater hub should only be used for resolving the problems.

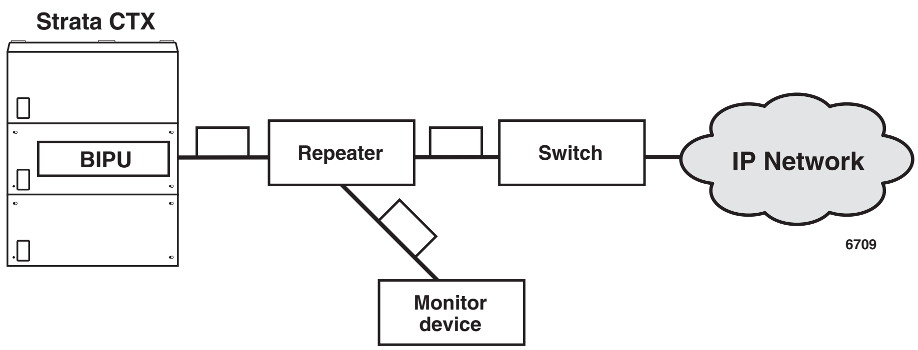


Figure 9-13 Repeater Hub Location

Using Switching Hub with Mirroring Function

By using mirroring function, it is possible to capture all send/receive data to one specific port (it's called source port). See Figure 9-14.

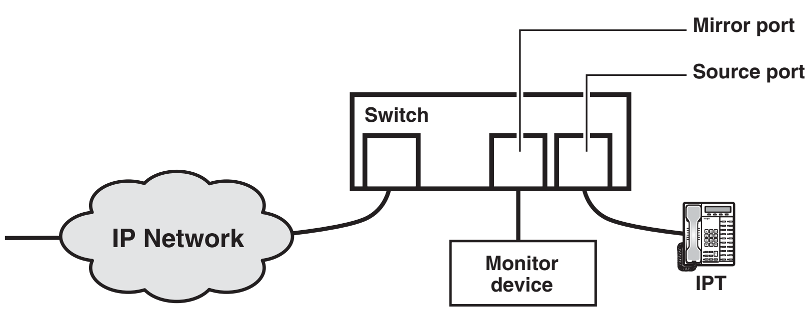


Figure 9-14 Switching Hub with Mirroring Function

Using PC or Workstation With Multiple Network Interfaces

Start capture tool and specify the network interface face on BIPU/IPT. See Figure 9-15.

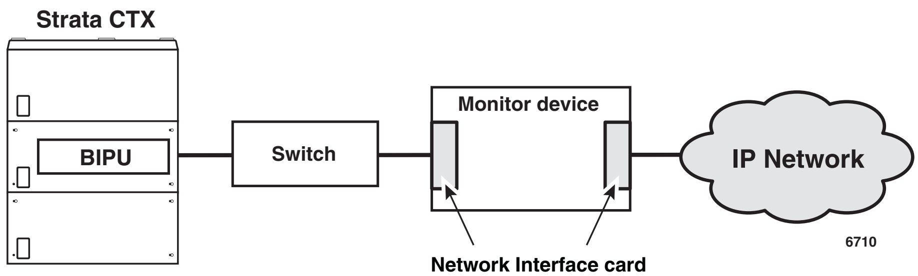


Figure 9-15 PC or Workstation With Multiple Network Interfaces

Requirement for Capture Tool

The following is the better, but not mandatory.

- Support GUI format (summary, details and dump).
- Enable to decode VoIP protocols.

Examples:

- Sniffer
- Ethereal
- Network Monitor for MS-Windows
- tcpdump (Linux, BSD)
- snoop (Solaris)

To analyze the captured data more efficiently, save the captured data in binary format (not text format). The libcap format is better (suffix is .cap).

IP Troubleshooting Resolutions

Table 9-10 IP Troubleshooting Problems and Resolutions

No.	Problem	Action	Cause	How to Resolve
1	IPT repeats reset and reboot.	"Remove that IPT from network. Execute ping command to an IP address assigned to that IPT from PC. Do you receive the reply packets?"	IP address was duplicated with other IPTs or network equipment.	Don't duplicate IP address.
2	**Connectivity Problems:** IPT is unable to connect to BIPU.	Verify the IPT configuration (enter terminal setting mode by pressing 3+6+9+Hold).		
		In FK11, Check the BIPU IP address is same as that of Prog151-FK1	Incorrect programming of BIPU IP address.	Re-configure the BIPU IP address correctly.
		Ping to BIPU but no replies are received.	1. LAN cable has come loose. 2. Gateway setting of IPT was mistaken."	1. Check LAN cable on a route. 2. Re-configure the Default Gateway address correctly.

Table 9-10 IP Troubleshooting Problems and Resolutions *(continued)*

No.	Problem	Action	Cause	How to Resolve
3	IPT has harsh noise during talking or hearing any tone.	Check the network equipment located on the routing path between BIPU and IPT.	Repeater HUB was used.	Replace to Switching HUB. Toshiba recommends the use of SW-HUB.”
		“Capture the network traffic between BIPU and IPT, and analyze the captured data. Verify the following. (1)The interval of RTP packets is almost same as the value configured by Prog 152-FK1. (2)This interval is constant.	Path band-width of the network between BIPU and IPT was too narrow.	Reduce the number of connected IPTs. Apply the priority control. Change voice CODEC to G.729A”
			Routing delay or packet loss due to low performance of routing devices (router or L3 switch).	Same as above.
			“Illegal packets were sent to BIPU/IPTs. Flow a lot of broadcast packets.”	Remove the originator.
4	**LAN Problems:** “IPT is unable to connect to BIPU. Condition: Two repeater HUBs were cascaded.”	Verify the specification of each repeater HUB.	10M-repeater HUB and 10/100M-repeater HUB were cascaded.	In case that some repeater HUB connects to the other one having different link speed each other, one of those needs to have internal bridge circuit.
5	No voice path	“If priority control function (IEEE802.1p) was set to ““enable””, return to ““disable”” and try again. If voice path was restored, verify the specification of routers/switches between BIPU and IPT.”	“Routers or LAN switches were unable to interpret Ethernet frame with VLAN tag correctly (IEEE802.1p uses a part of VLAN tag field). So, these frames were discarded by the router/switch.”	Disable IEEE802.1p function. *note) Equipment not to be complied with IEEE802.1Q/1p seem to regard ethernet frames with VLAN tag field as illegal frames and to discard these frames.
6	“IPT is unable to connect to BIPU. Condition: IPT connects to LAN switch complied with IEEE802.1Q (tag-based VLAN).”	Check the port configuration of LAN switch.	The IPT connection port was configured as tag-based VLAN port. Therefore, this port passed only ethernet frames with VLAN-ID same as port configuration, and discarded other frames.	Disable VLAN setting. IP-CTX does not support tag-based VLAN. So, BIPU and IPT cannot belong any VLAN.
7	There are two gateways in the network segment which BIPU belongs, and one of them is configured as default gateway of BIPU.	-	restriction	If default gateway is down for a while, BIPU cannot re-route another gateway automatically.
8	IPT Problems: “IPT shows ““Can’t set IPaddress””.”	Check the DHCP server exists on the same network as that IPT.	DHCP server does not exists on the network.	Setting up and starting DHCP service, or configure IPT’s IP address and Subnet mask manually.
			DHCP server is located beyond the router.	Setting up and starting DHCP service on the same network as that IPT.

Table 9-10 IP Troubleshooting Problems and Resolutions *(continued)*

No.	Problem	Action	Cause	How to Resolve
	IPT Problems:			
9	“IPT shows ““BIPU not found””.”	Verify the following: 1. BIPU is running (heart-beat LED is blinking). 2. Ping to BIPU is successful. 3. BIPU discovery mode in terminal setting mode. If ““2:Broadcast”” is selected, BIPUs have to locate same network segment as IPT.”	1. BIPU was down. 2. BIPU was network unreachable. 3. BIPU was located beyond the router but IPT tried to discover BIPU by broadcasting.”	3. Change BIPU discovery mode to ““1:Manual”” and configure BIPU IP address in IPT terminal setting mode.”
10	“IPT shows ““Can’t get StationID””.”	Check there are available Station IDs.	All Station IDs are already used by other IPTs.	New IPT assigns by Prog 200 and permits Automatic Station ID Assignment by Prog 150 or Prog 250.
		Check CTX permits the Automatic Station ID Assignment.	“Programming as Automatic Station ID Assignment is set to ““disable””.”	Permits Automatic Station ID Assignment by Prog 150 or Prog 250.
11	“IPT shows ““StationID unmatch””.”	Step 1: Enter terminal setting mode, and then press dial ““2”” to enter network configurations, and then press FK5 to display the StationID. Step 2: Enter CTX programming mode, and then enter prime DN same as Station ID in Prog 250. Command error or not?”	Station ID is out of prime DN list which are assigned to IPT.	Set Station ID from within prime DN list which are assigned to IPT.
12	“IPT shows ““Not exist Multicast addr””.”	Enter the terminal configuration mode, and then press ““2”” to enter the network configuration. Verify the following: (1) FK11 (2) FK13”	“In FK11, ““3:Multicast”” was selected, but no multicast address was assigned in FK13.”	Change BIPU discovery mode (FK11), or enter the multicast address for discovery. **Note** CTX does not support the procedure of discovery using multicast. This is future support.”
13	“IPT shows ““Not exist BIPU addr””.”	“Enter the terminal configuration mode, and then press ““2”” to enter the network configuration. Verify the following: (1) FK11 (2) FK12”	“In FK11, ““1:Manual”” was selected, but no BIPU address was assigned in FK12.”	Change BIPU discovery mode, or enter the BIPU address for discovery.
14	“IPT shows ““Can’t register IPT:E0””.”	1. Enter terminal configuration mode, then press ““2”” to enter the network configuration. Verify StationID in FK5. 2. In Prog 250, enter prime DN same as the StationID verified step1. 3. If no error, move step4.”	“Station ID assigned in terminal configuration mode was out of IPT’s prime DN list. Maybe this station was deleted or prime DN was changed.”	Change Station ID.
		4. Try the following: Enter Prog 250 with Prime DN same as the Station ID verified Step 1. Select FK8 and change voice CODEC.	Terminal data regarding that StationID was not synchronized between CTX and BIPU. Maybe BIPU failed to receive the data.	This is a known problem.

Table 9-10 IP Troubleshooting Problems and Resolutions *(continued)*

No.	Problem	Action	Cause	How to Resolve
	IPT Problems:			
15	"IPT shows ""Can't register IPT:E4""."	Find the IPT which has same Station ID.	Station ID duplicated.	Set unique Station ID.
16	"IPT shows ""Can't register IPT:E11""."		No resources are available.	Create a new IPT terminal in Prog 200. Or, Change destination BIPU having some idle resources."
17	"IPT shows ""Can't register IPT:E13""."	"Check CTX applies Terminal Authentication feature, or, IP address filtering. Verify Prog 150 FK2 and Prog 250 FK5, FK6 for Terminal Authentication. Verify Prog 250 FK2, FK3 for IP address filtering."	1. Terminal Authentication feature was applied but Station MAC address was different from that programmed in CTX. 2. IP address filtering was applied but Station IP address was different from that programmed in CTX."	See Spec.1203 for Terminal Authentication. See Spec.1200 for IP address filtering."
18	"IPT shows ""BIPU TCP CONNECT ERROR""."		Fail to establish TCP connection to BIPU.	
19	"IPT shows ""BIPU TCP PORT IS CLOSED""."		TCP connection was disconnected by BIPU.	
20	"IPT shows ""BIPU ALIVE PACKET STOP""."		Keep-Alive was failing.	
21				
22				

Private Networking Over Internet Protocol

Strata Net CTX multi-system networking can be implemented over an IP network using Strata CTX systems with BIPU-Q1A IP interface PCBs. The BIPU-Q1A requires CTX Release 2.1 software. This feature offers the same connection service as ISDN dedicated lines with QSIG protocol on the public network. QSIG over IP, like any other IP device (i.e., Cisco routers, etc.) does support reliable passage of modemized data signals, such as modem signal and G3 fax.

BIPU-Q1A - Strata Net QSIG over IP Interface Unit

Circuits per PCB: *eight or 16 circuits*

Interfaces with: *Strata Net over IP Networking*

Older Version(s): *None*

The BIPU-Q1A can be configured for up to 16 channels in system programming. The BIPU-Q1A supports the same functions of call control as the dedicated ISDN QSIG interface and the two interface types can be mixed in on a Strata Net network. However, the BIPU-Q1A only interfaces with the BIPU-Q1A, not with the BPTU or RPTU interfaces and vice versa.

For bandwidth requirements, refer to the section “Strata Net QSIG Over IP and IPT Bandwidth Requirements” on page 9-41.

Refer to “Dos and Don’ts for Setting Up the System” on page 9-2 if you are planning to mix analog and IP QSIG circuit cards in the same Strata CTX system.

An example of Strata Net QSIG over IP networking is shown below.

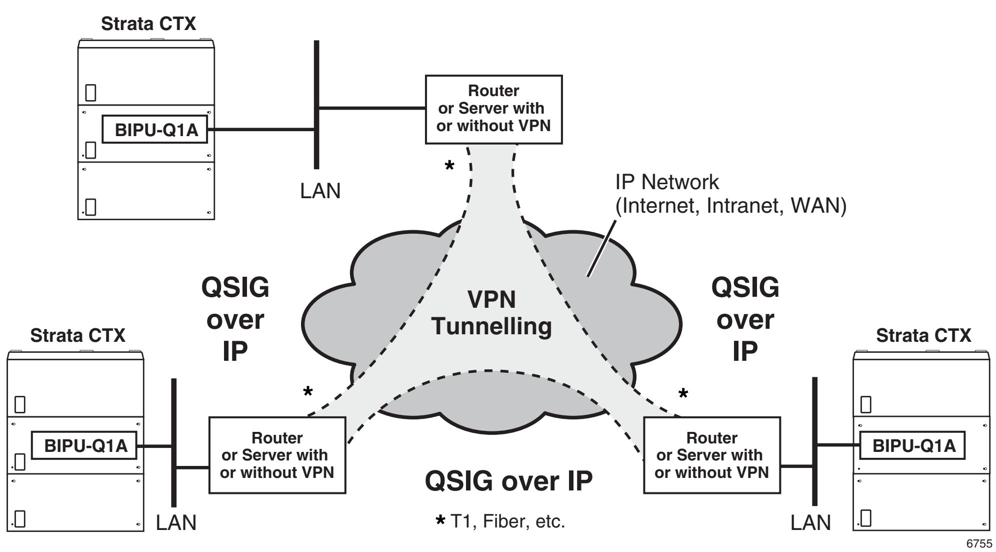


Figure 9-16 QSIG Over IP Example

Strata Net QSIG Over IP and IPT Bandwidth Requirements

The bandwidth requirements for Strata Net QSIG over IP is the same as those for IP telephones. Refer to Table 9-1 on page 9-5 to estimate the quality of service (Excellent, Good, Fair, and Poor) provided by CTX IP QSIG channels depending heavily on the LAN parameters.

When sharing voice and data on the same network segment, the data will cause some jitter in voice communications, especially on slower segments. Table 9-11 shows calculations of the amount of jitter assuming a worst case data packet size of 1500 bytes (Maximum Transmission Unit (MTU) = 1500) based on a segment's bandwidth. This also requires that the routers connecting the segment through the WAN support Diffserv.

Note A router that doesn't support Diffserv may stack multiple data packets together increasing the jitter perhaps indefinately. And the voice quality will be indeterminate.

Table 9-11 QSIG over IP Jitter on Mixed Voice and Data WAN

No. of B-Channels of WAN	Bandwidth (kbps)	Time to transmit max. MTU (ms)	Expected Jitter (ms)	Class
2	128	93.75	100	Poor
4	256	46.88	50	Fair
6	384	23.44	30	Fair
8	512	15.63	20	Good
24	1536	1.00	1	Excellent

Class definition categories are shown in Table 9-12.

Table 9-12 QSIG over IPClass Definitions

Class	Delay (ms)	Jitter (ms)
Excellent	< 20	< 10
Good	< 50	< 20
Fair	< 100	< 50
Poor	< 200	< 100

Table 9-13 shows the amount of bandwidth required for setting up and tearing down calls independent of the amount of voice traffic.

Table 9-13 QSIG over IP Bandwidth Required for Call Setup

Traffic Rate (BHCA[1])	Required Bandwidth
1000	6
2000	12
4000	23
6000	36

1. BHC = Busy Hour Call Attempts

IP Telephony and QSIG Over IP

So the amount of bandwidth that is required on a segment to support a specific number of calls is the sum of the number of channels multiplied by the bandwidth for the selected CODEC and interval, plus the bandwidth required for the selected number of busy hour call attempts. And the jitter is determined by the bandwidth of the WAN segment.

Example: If you want to support 4 calls using the G..711 CODEC with a 20 msec. interval, this requires 4 x 88 kbps = 352 kbps of bandwidth. In addition, to support 1000 busy hour call attempts, 6 kbps must be added for a total of 358 kbps. If only voice is going to be carried on the segment, then a 384 kbps segment (6 B-channels) is sufficient. If voice and data are going to be mixed on the segment, then at least 25% (89.5 kbps) should be added, or more, based on the amount of data traffic desired. In this case, a total of 447 kbps will be required which would best be supported by a 512 kbps segment (8 B-channels). This would result in an expected jitter of 20 ms in the voice traffic.

BIPU-Q1A Installation

1. Make sure the BIPS1A daughter card is securely installed onto the BIPU-Q1A PCB (the BIPS1A is installed on the BIPU-Q1A at the factory). See Figure 9-2 on page 9-6.
2. Install the BIPU-Q1A into one of the following slots:
   - CTX100 Base and Expansion Cabinet slots (1~8, 16 channels per slot per Program 100)
   - CTX670 Base Cabinet slots (1~8, 16 channels per slot per Program 100)
   - CTX670 Expansion Cabinet slots (1~6, 16 channels per slot per Program 100)
3. Follow the procedure in Chapter 2 – Strata CTX Configuration to check the cabinet power factor.
4. Power up the system. Refer to Table 9-2 for status indicators.
5. Program the CTX per the instructions in the *Strata CTX Programming Manual.*

Connect BIPU-Q1A to LAN, Server or Router

1. Plug one end of a straight-through CAT5/5e/6 LAN cable into the RJ45 Ethernet port on the BIPU-Q1A PCB in the CTX. (See Figure 9-2 on page 9-6.)
2. Plug the other end of the BIPU-Q1A CAT5/5e/6 LAN cord into a LAN, server or router jack.

Note The BIPU-M2A or Q1A-switch cables are straight-through cables.

Table 9-14 BIPU-Q1A or BIPU-M2A Buttons, LEDs and Jumpers

Indicator	Definition
Ethernet Port LEDs	RD - Indicates BIPU-M2A or BIPUQ1A receives data from switch. LINK - Indicates data activity between BIPU-M2A and switch SD - Indicates BIPU-M2A or BIPUQ1A sends data to switch.
Heartbeat LEDs	Flashes at a steady rate to indicate BIPU-M1A or BIPU-M2A or BIPUQ1A is operating normally.
Status/Alarm LEDs	For Toshiba Field Support Engineering use only.
Reset button	Use when requested by Toshiba Field Support Engineer.
RS232 Maintenance Jack	For Toshiba Field Support Engineers only.

Figure 9-17 BIPU-Q1A or BIPU-M2A PCB

MDF PCB Wiring 10

This chapter contains point-to-point wiring diagrams for connection of telephones, lines, peripheral equipment, and power supplies for the universal slot PCBs of the Strata CTX system.

Wiring diagrams are divided into groups according to the PCB which provides the interface for, or controls the operation of, the associated equipment as listed below:

Stations	PCB
DKTs (BPCI, DDSS, DDCB, ADM and BATU)	ADKU, BDKU/BDKS, BWDKU
DKTs and DDSS	PDKU
External Power for DKTs and DDCB	BDKU, PDKU
DKTs or Standard Phones	RDSU
Standard Telephone	ASTU, RSTU, RDSU, RSTS, PSTU
CO Lines	**PCB**
Analog Ground Start	RGLU
Analog Loop Start	RCOU/RCOS
Analog E911	RMCU/RMCS
Caller ID with RGLU or RCOU/RCOS	RCIU/RCIS
Analog DID/CO Lines	RDDU
Analog E&M Tie Lines	REMU
	PEMU
Option Interface	**PCB**
External Paging, Night Bell, Night Transfer Door Lock and BGM mute control	BIOU
Power Failure	**PCB**
DPFT Power Failure Transfer box	DPFT

Notes

- Before using the Connect Record Sheets (following each Wiring Diagram), make copies for future use.
- The RDTU2 cable connection information is in Chapter 8 – T1.
- The RDTU, RBUU, RBUS cable connection is in Chapter 10 – MDF PCB Wiring.

Station Loop Lengths

In a single site installation, the Base and optional Expansion Cabinets must be placed within the allowed maximum distance of each other as designated by Table 10-1

Table 10-1 Station Loop Lengths[1]

<table>
<tr><th rowspan="2">Mode</th><th colspan="3">Maximum line length (24 AWG)</th></tr>
<tr><th>1 Pair[2]</th><th>2 Pair</th><th>1 Pair plus external power [3]</th></tr>
<tr><td>DKT3000 or DKT2000-series [4]</td><td rowspan="6">1000 ft. (303m)</td><td rowspan="9">1000 ft. (303m)</td><td rowspan="9">1000 ft. (303m)</td></tr>
<tr><td>DKT with BVSU or DVSU</td></tr>
<tr><td>DKT with
BHEU or HHEU</td></tr>
<tr><td>DKT with BPCI</td></tr>
<tr><td>DKT with BPCI + BHEU</td></tr>
<tr><td>DKT with BVSU + BHEU
or DVSU + HHEU</td></tr>
<tr><td>DKT with DADM3020 or DADM2020 (1 ADM)[2]</td><td>675 ft. (204m)</td></tr>
<tr><td>DKT with DADM3020 or DADM2020 (2 ADMs)[2]</td><td>500 ft. (151m)</td></tr>
<tr><td>DDSS3060 or DDSS2060</td><td rowspan="3">1000 ft. (303m)</td></tr>
<tr><td>BATI, RATI</td><td>n/a</td><td>n/a</td></tr>
<tr><td>DDCB3</td><td>1000 ft. (303m)</td><td>1000 ft. (303m)</td></tr>
<tr><td rowspan="3">Standard telephones, voice mail, AA, etc.</td><td>Approx. 3000 ft. (909 m) with 150 ohm device. [5]</td><td rowspan="3">n/a</td><td rowspan="3">n/a</td></tr>
<tr><td>Approx. 9000 ft. (2727 m) with 150 ohm device.[5]</td></tr>
<tr><td>Approx. 21000 ft. (6363 m) with 150 ohm device.[5]</td></tr>
<tr><td>IPT1020-SD</td><td colspan="3">The IP telephone interface is 10Base-T/100Base-TX and requires CAT5/5e/6 twisted pair cabling.
The maximum distance between the IP telephone jack and the ethernet device it connects to is 100 meters (328 ft.). This includes the 3 meter (9.84 ft.) straight-through CAT5 cable (black) supplied with the IP telephone. Ethernet devices include BIPU-M2A, BIPU-M1A servers, routers, etc.</td></tr>
</table>

1. When the system is powered by backup battery, range may be less as the backup battery is discharged.
2. One-pair wiring must be used with BWDKU and BDKS (see Figure 10-3 on page 10-6). The BWDKU and BDKS do not support two pair wiring.
3. Two-pair wiring or optional telephone power supply is required to achieve maximum range in all cases.
4. BDKS and BWDKU do not provide the power wire pair; an external power supply is required to achieve maximum range (see Figure 10-6 on page 10-9).
5. See manufacturer's product specifications for exact resistance of device.

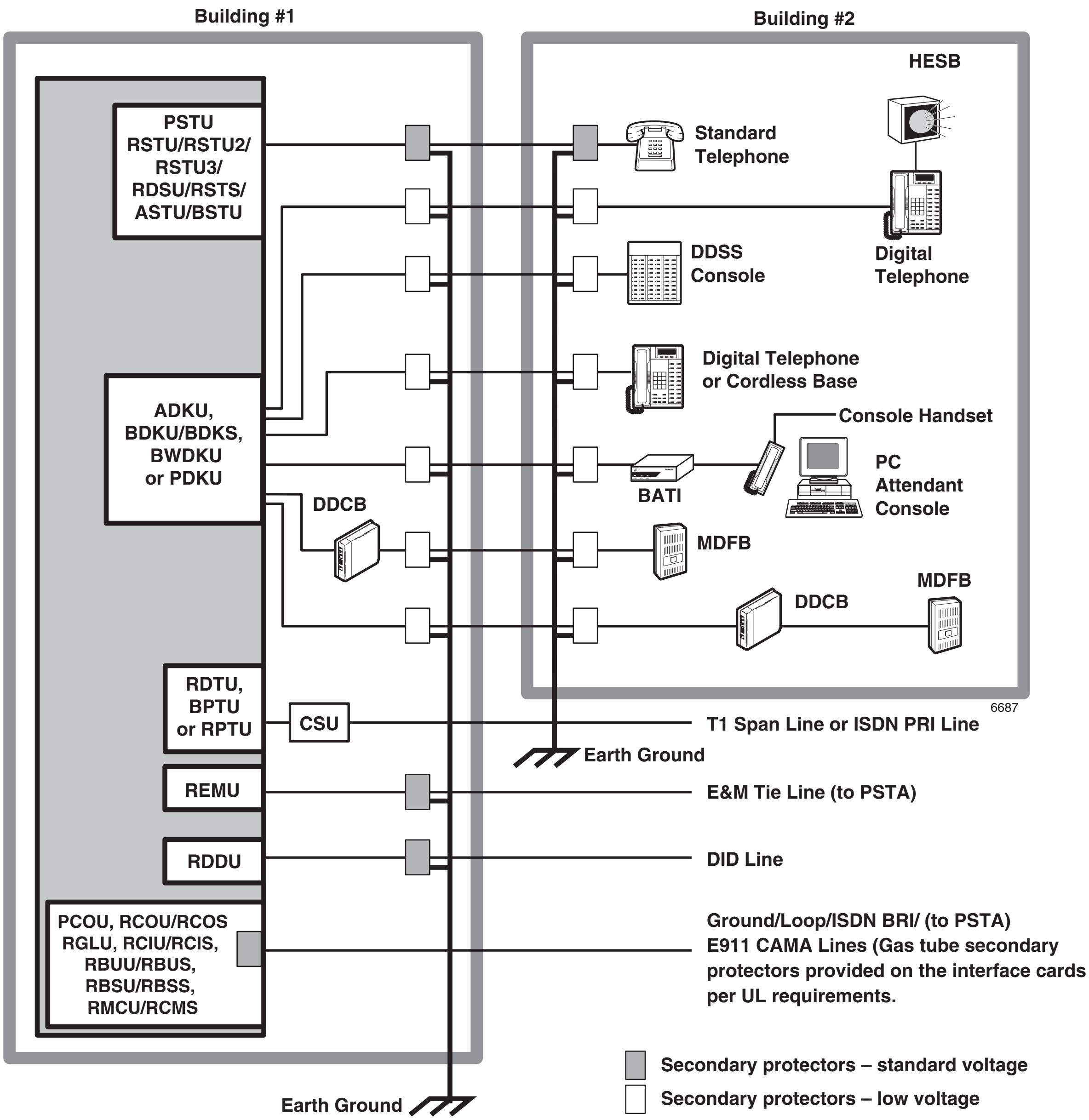
DKT3000-series telephone loop limits are in Table 10-2.

Table 10-2 Loop Limits for DKT3000-series Telephones

<table>
<tr><th rowspan="2">Telephone/Device</th><th rowspan="2">Power Supply Unit (PSU) or Battery Backup</th><th colspan="3">Maximum line length (24 AWG)</th></tr>
<tr><th>1 Pair[1]</th><th>2 Pair</th><th>1 Pair plus external power[2]</th></tr>
<tr><td rowspan="2">DKT3000-series or DKT2000-series models[3],
DKT with BVSU or DVSU or DKT with BHEU or HHEU</td><td>PSU</td><td>1000 ft. (303m)</td><td rowspan="9">1000 ft. (303m)</td><td rowspan="12">1000 ft. (303m)</td></tr>
<tr><td>Battery Backup</td><td>675 ft. (204m)</td></tr>
<tr><td rowspan="2">DKT with BPCI</td><td>PSU</td><td>1000 ft. (303m)</td></tr>
<tr><td>Battery Backup</td><td>500 ft. (151m)</td></tr>
<tr><td rowspan="2">DKT with BPCI + BHEU</td><td>PSU</td><td>1000 ft. (303m)</td></tr>
<tr><td>Battery Backup</td><td>500 ft. (151m)</td></tr>
<tr><td rowspan="2">DKT with DADM3020 or DADM2020 (1 ADM)</td><td>PSU</td><td>675 ft. (204m)</td></tr>
<tr><td>Battery Backup</td><td>165 ft. (50m)</td></tr>
<tr><td rowspan="2">DKT with DADM3020 or DADM2020 (2 ADMs)</td><td>PSU</td><td>500 ft. (151m)</td></tr>
<tr><td>Battery Backup</td><td>33 ft. (10m)</td><td>330 ft. (100m)</td></tr>
<tr><td rowspan="2">DDSS3060 or DDSS2060</td><td>PSU</td><td>1000 ft. (303m)</td><td>1000 ft. (303m)</td></tr>
<tr><td>Battery Backup</td><td>675 ft. (204m)</td><td>1000 ft. (303m)</td></tr>
<tr><td rowspan="2">BATI, RATI</td><td>PSU</td><td>1000 ft. (303m)</td><td>n/a</td><td>n/a</td></tr>
<tr><td>Battery Backup</td><td>1000 ft. (303m)</td><td>n/a</td><td>n/a</td></tr>
<tr><td rowspan="2">DDCB3A</td><td>PSU</td><td>1000 ft. (303m)</td><td>1000 ft. (303m)</td><td>1000 ft. (303m)</td></tr>
<tr><td>Battery Backup</td><td>165 ft. (50m)</td><td>675 ft. (204m)</td><td>1000 ft. (303m)</td></tr>
</table>

1. One pair wiring must be used with BWDKU. The BWDKU does not support two pair wiring.
2. Two pair wiring or optional telephone power supply is required to achieve maximum range in all cases.
3. BDKS does not provide the power wire pair, an external power supply is required to achieve maximum range (see Figure 10-2).

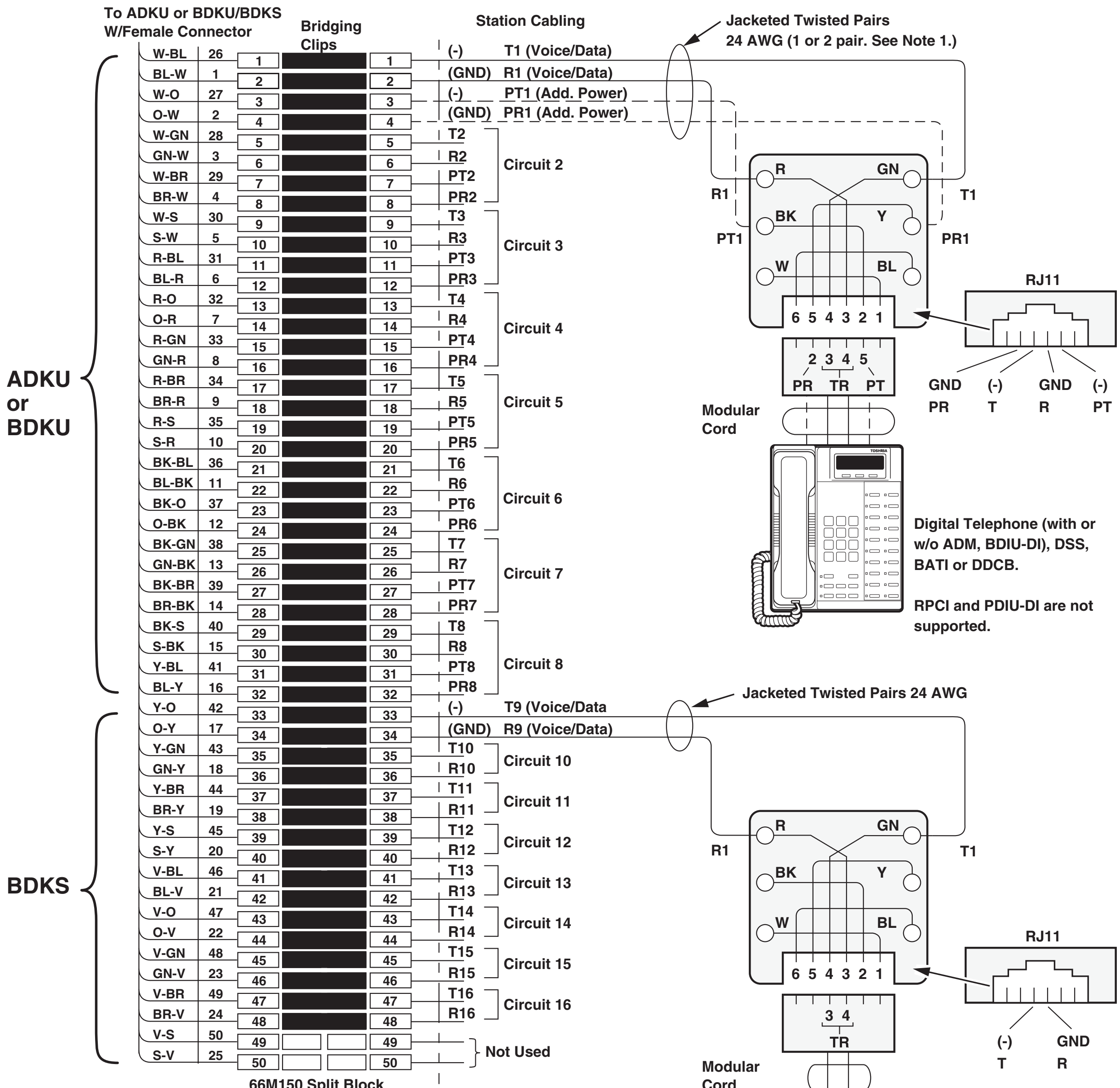
Station Wiring Diagrams



Important! *To protect against transient voltages and currents, solid state secondary protectors must be installed if there is outside wiring, and on all DID and E&M Tie lines. These protectors, which contain fast semiconductors in addition to fuses, shall comply with the requirements for secondary protectors for communication circuits, UL 497A. Care must be taken to ensure that they are very well grounded to a reliable earth ground. Recommended protectors are available in the fast Series 6 line from ONEAC Corp., Libertyville, Illinois 60048, (800) 327-8801. Install and test the secondary protectors precisely to the installation instructions of the manufacturer.*

Figure 10-1 Strata CTX Secondary Protector Diagram

ADKU and BDKU/BDKS Digital Station Wiring



Notes

1. T/R wires are always required; PT/PR are additional power wires required only for long station runs per Table 10-1. PT/PR may be used with normal station runs also.
2. Voltage levels:
   T, PT = -26.3~27.8 VDC
   R, PR = 0.0 VDC (GND). Reference to SG ground.

Figure 10-2 ADKU and BDKU/BDKS (DKT, DDCB, ADM, DDS, BATI, BDIU-DI) Wiring

BWDKU Digital Station Wiring

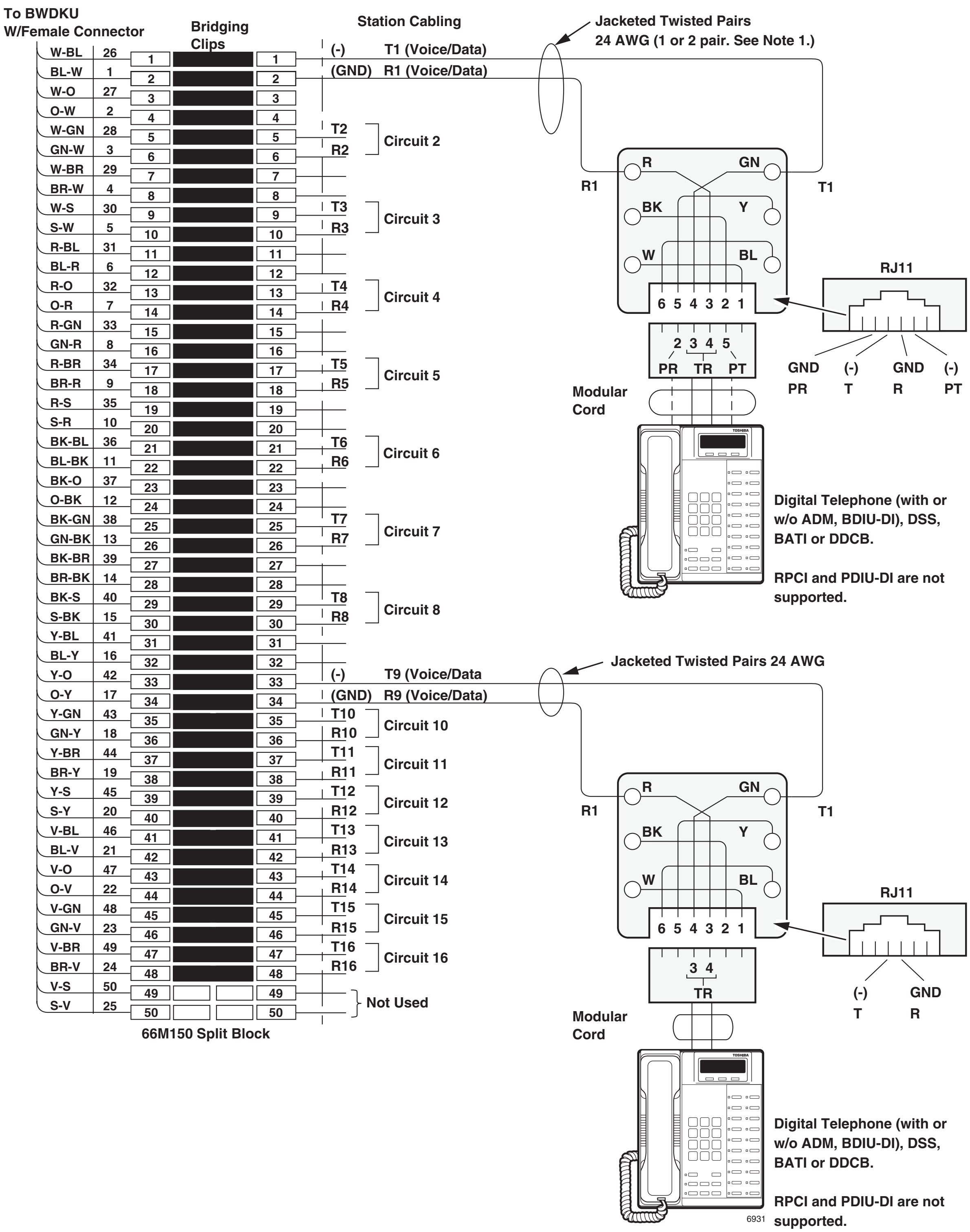


Figure 10-3 BWDKU Digital Station Wiring

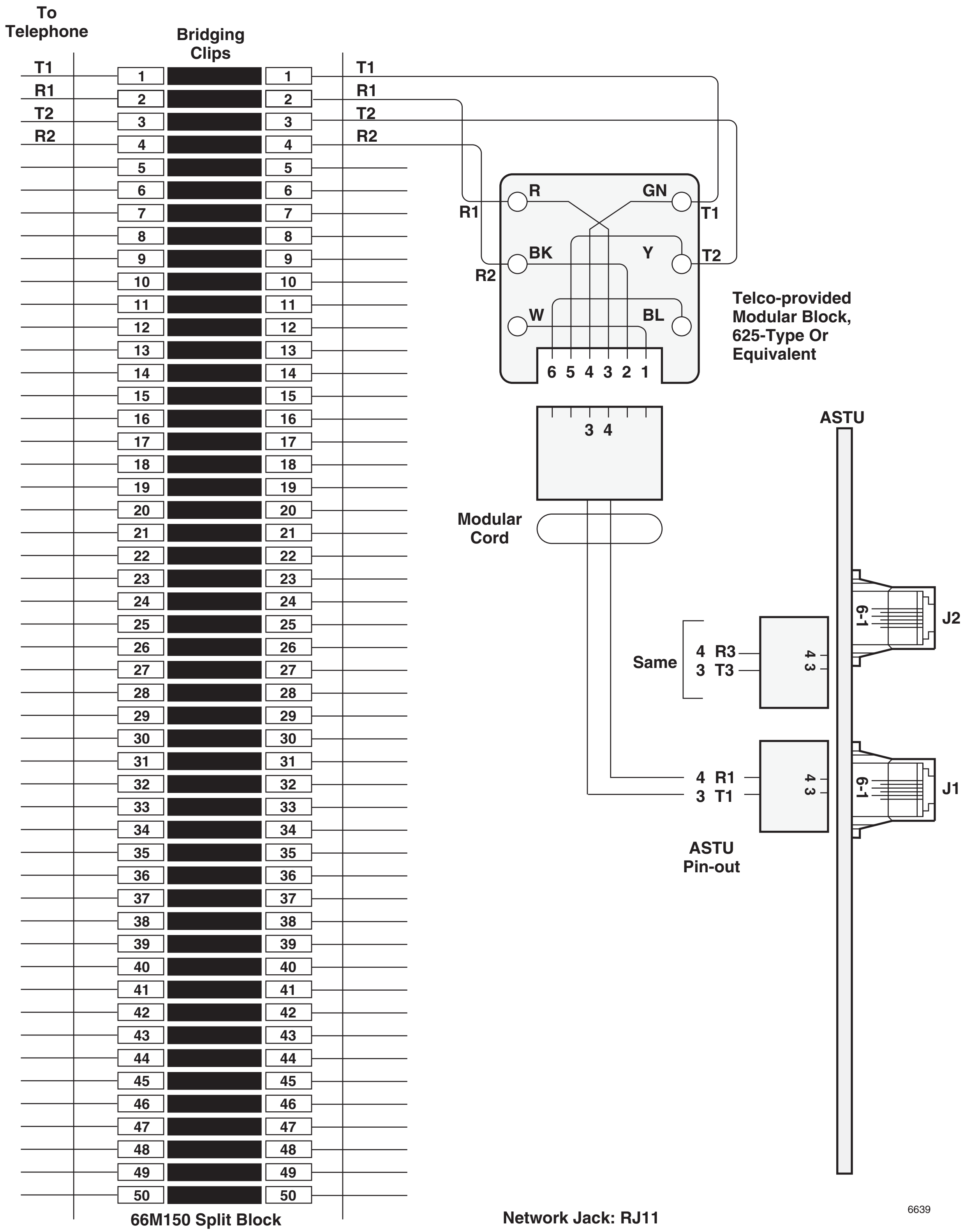
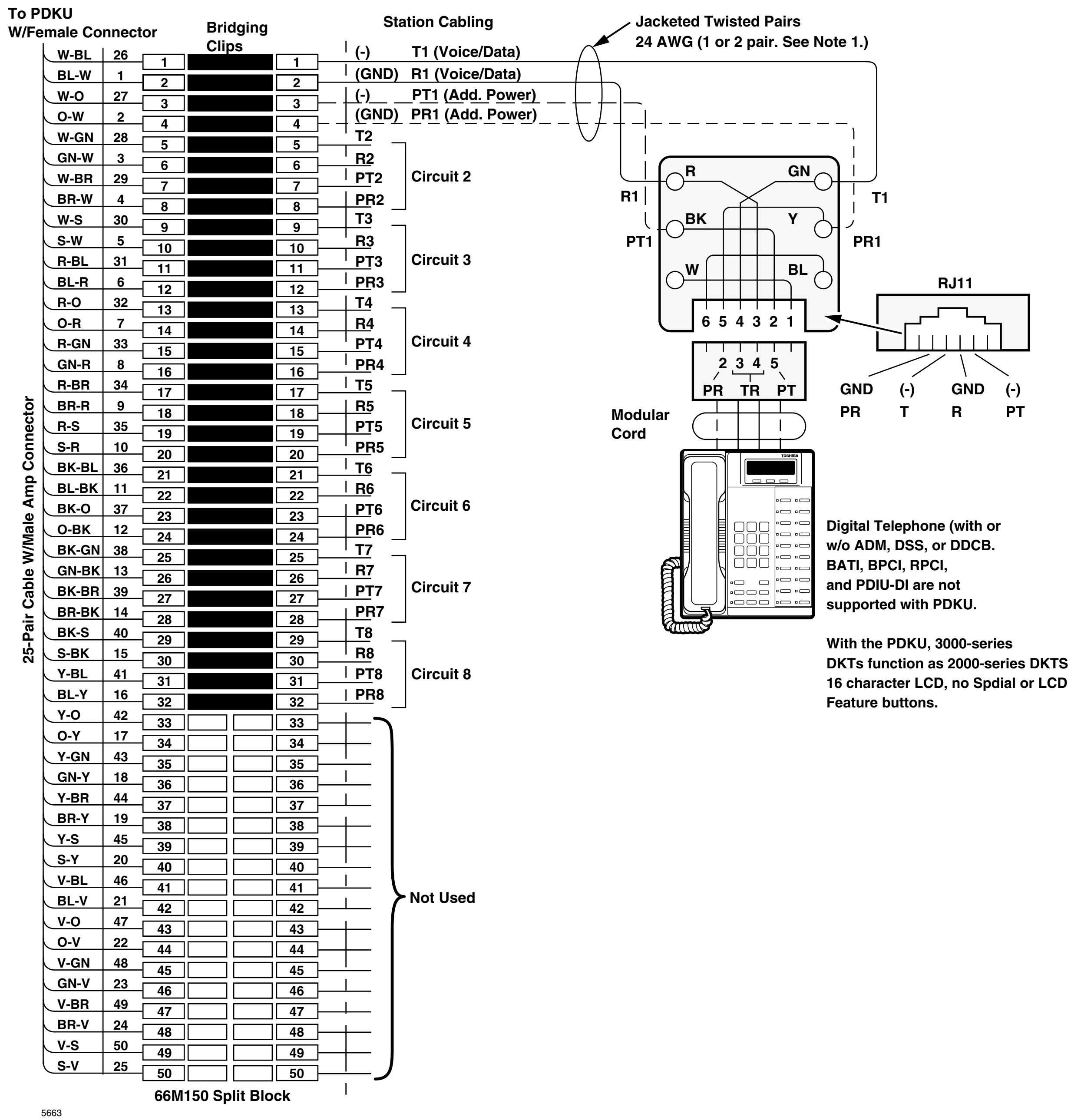


Figure 10-4 ASTU Wiring

PDKU Digital Station Wiring



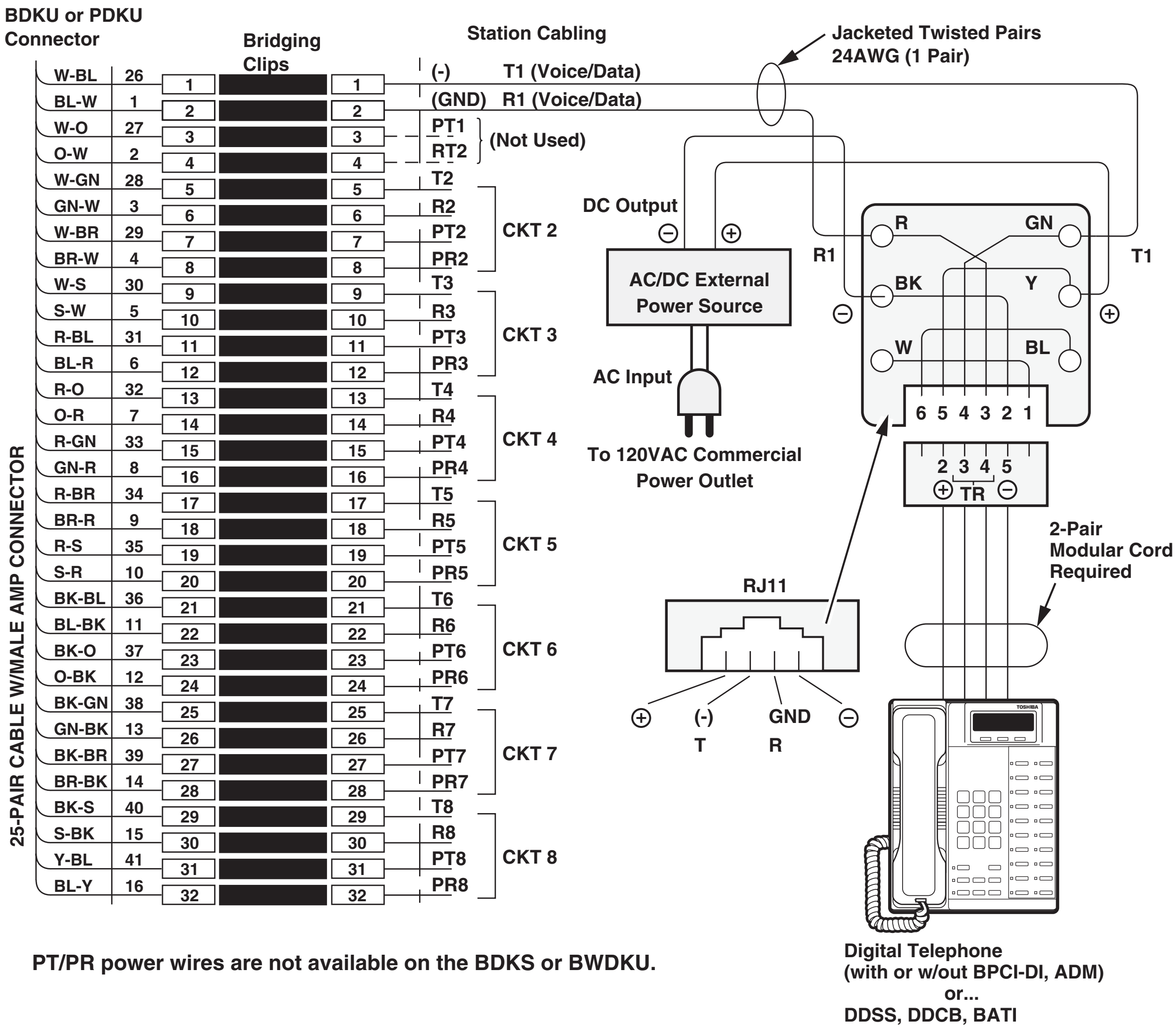
Notes

1. T/R wires are always required; PT/PR are additional power wires required only for long station runs per Table 10-1. PT/PR may be used with normal station runs also.

   Voltage levels:
   T, PT = -26.3~27.8 VDC
   R, PR = 0.0 VDC (GND). Reference to SG ground.

Figure 10-5 PDKU Wiring

Digital Telephone DSS and DDCB External Power Connection



PT/PR power wires are not available on the BDKS or BWDKU.

AC/DC External Power Source Specifications:

AC IN: 120VAC ± 10%
DC OUT: 24VDC ± 10%
160 MA (Min.) DC Current
200 MV P-P (Max) AC Ripple On DC Output

AC/DC power supplies that meet the above requirements are available from most telephone equipment supply houses.

External Power Straps:

If the external power is installed, cut the external power straps located inside the digital telephone DDSS, DDCB.

See Table 10-1 on page 10-2 for external power

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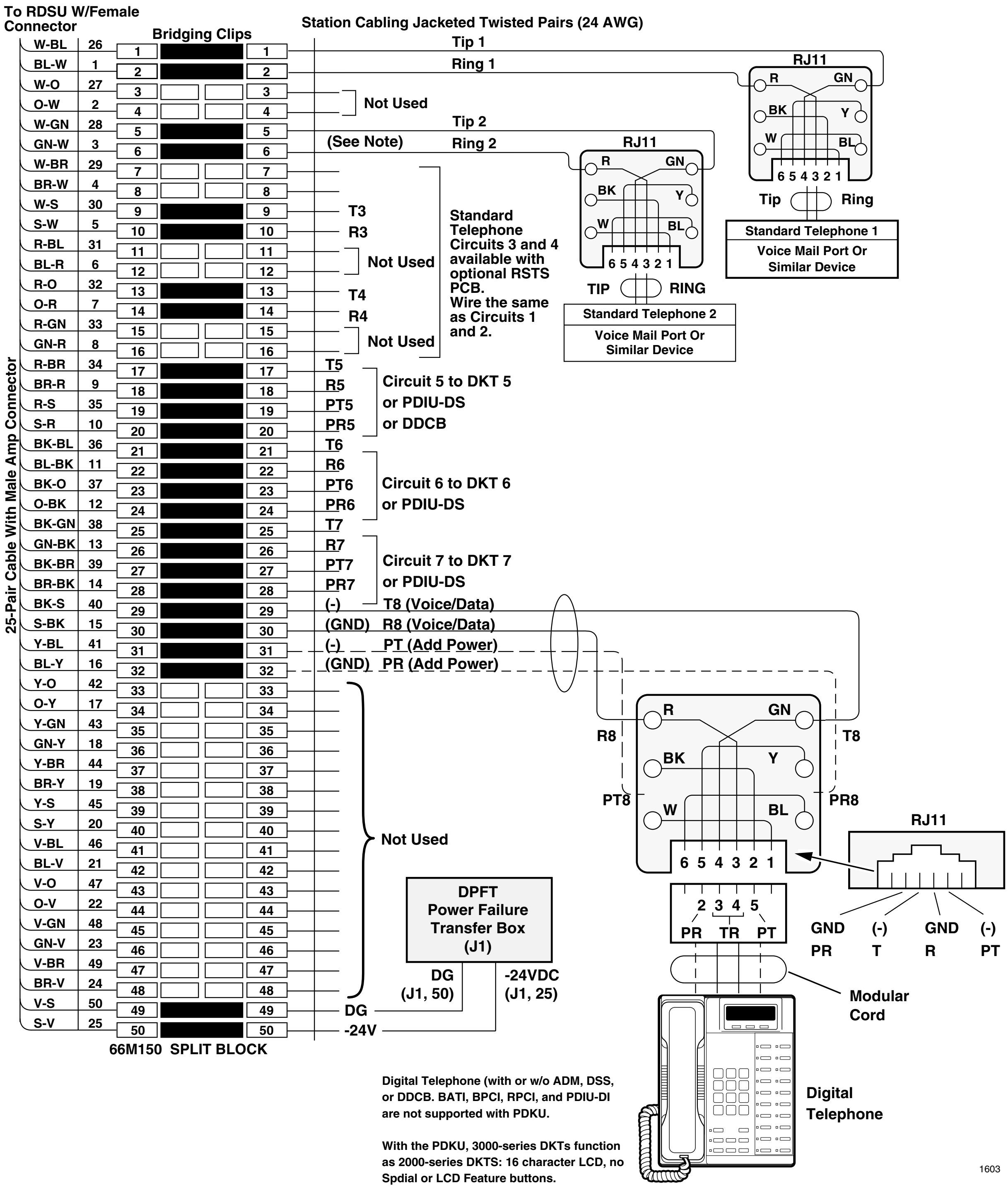
Figure 10-6 Digital Telephone DSS and DDCB External Power Connection

Table 10-3 BDKU Station MDF Cross Connect Record

MDF Block Number | **KSU Slot Number**

Color Code	Designation	CKT	PDN	Intercom	Device/Standard Telephone	
W-Bl	T	1				ADKU, BDKU or PDKU
Bl-W	R					
W-O	PRW-T					
O-W	PRW-R					
W-G	T	2				
G-W	R					
W-Br	PRW-T					
Br-W	PRW-R					
W-S	T	3				
S-W	R					
R-Bl	PRW-T					
Bl-R	PRW-R					
R-O	T	4				
O-R	R					
R-G	PRW-T					
G-R	PRW-R					
R-Br	T	5				
Br-R	R					
R-S	PRW-T					
S-R	PRW-R					
Bk-Bl	T	6				
Bl-Bk	R					
Bk-O	PRW-T					
O-Bk	PRW-R					
Bk-G	T	7				
G-Bk	R					
Bk-Br	PRW-T					
Br-Bk	PRW-R					
Bk-S	T	8				
S-Bk	R					
Y-Bl	PRW-T					
Bl-Y	PRW-R					
Y-O	T	9				BDKS
O-Y	R					
Y-GN	T	10				
GN-Y	R					
Y-BR	T	11				
BR-Y	R					
Y-S	T	12				
S-Y	R					
V-BL	T	13				
BL-V	R					
V-O	T	14				
O-V	R					
V-GN	T	15				
GN-V	R					
V-BR	T	16				
BR-V	R					

RDSU Wiring



Digital Telephone (with or w/o ADM, DSS, or DDCB. BATI, BPCI, RPCI, and PDIU-DI are not supported with PDKU.

With the PDKU, 3000-series DKTs function as 2000-series DKTS: 16 character LCD, no Spdial or LCD Feature buttons.

Figure 10-7 RDSU Wiring

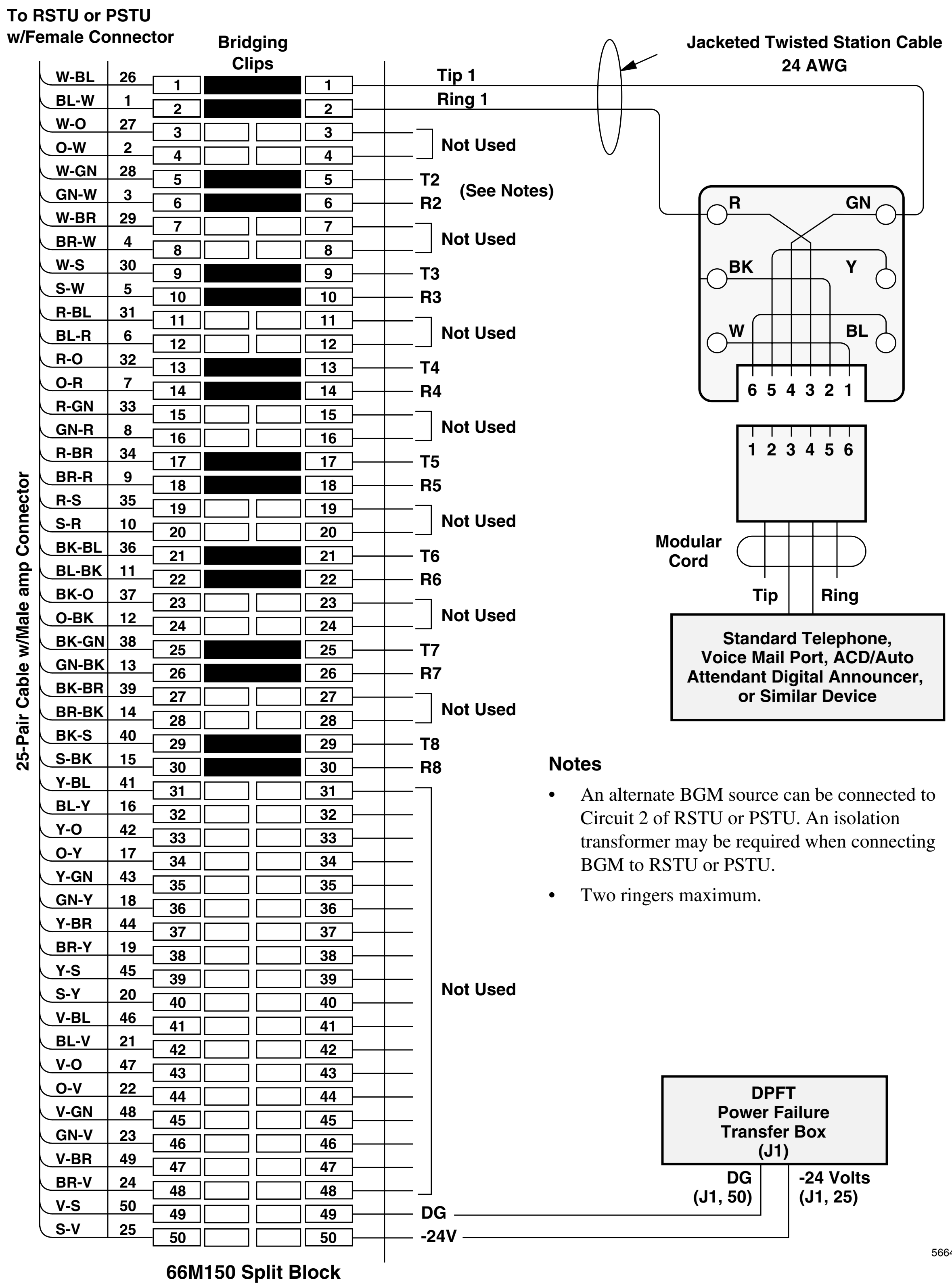
Table 10-4 RDSU Station MDF Cross Connect Record

MDF Block Number		**KSU Slot Number**	

Color Code	Designation	CKT Number	Port Number	Directory Number	Device/Standard Telephone Location
W-Bl	T	1		(Standard)	
Bl-W	R				
W-O	Not Used				
O-W	Not Used				
W-G	T	2		(Standard)	Indicate if separate BGM source connected to Circuit 2.
G-W	R				
W-Br	Not Used				
Br-W	Not Used				
W-S	T	3		(Standard) (RSTS)	
S-W	R				
R-Bl	Not Used				
Bl-R	Not Used				
R-O	T	4		(Standard) (RSTS)	
O-R	R				
R-G	Not Used				
G-R	Not Used				
R-Br	T	5		(Digital)	DDCBs connect only to Circuit 5, Ports 004, 012, 020, and 028
Br-R	R				
R-S	PWRT				
S-R	PWRR				
Bk-Bl	T	6		(Digital)	
Bl-Bk	R				
Bk-O	PWRT				
O-Bk	PWRR				
Bk-G	T	7		(Digital)	
G-Bk	R				
Bk-Br	PWRT				
Br-Bk	PWRR				
Bk-S	T	8		(Digital)	
S-Bk	R				
Y-Bl	PWRT				
Bl-Y	PWRR				
V-S	Data Ground	N/A	N/A	N/A	DPFT – Power Failure Transfer Box
S-V	-24VDC				

Note Indicate if standard telephone, voice mail port, etc.

RSTU or PSTU Analog Devices Wiring



Notes

- An alternate BGM source can be connected to Circuit 2 of RSTU or PSTU. An isolation transformer may be required when connecting BGM to RSTU or PSTU.
- Two ringers maximum.

Figure 10-8 RSTU or PSTU Wiring

Table 10-5 RSTU/RSTU2/RDSU/RSTS/PSTU/PSTU2 Station MDF Cross Connect Record

MDF Block Number		**KSU Slot Number**	

Color Code	Designation	CKT Number	Port Number	Intercom Number	Device/Standard Telephone Location
W-Bl	T	1			
Bl-W	R				
W-O	Not Used				
O-W	Not Used				
W-G	T	2			Indicate if separate BGM source.
G-W	R				
W-Br	Not Used				
Br-W	Not Used				
W-S	T	3			
S-W	R				
R-Bl	Not Used				
Bl-R	Not Used				
R-O	T	4			
O-R	R				
R-G	Not Used				
G-R	Not Used				
R-Br	T	5			
Br-R	R				
R-S	Not Used				
S-R	Not Used				
Bk-Bl	T	6			
Bl-Bk	R				
Bk-O	Not Used				
O-Bk	Not Used				
Bk-G	T	7			
G-Bk	R				
Bk-Br	Not Used				
Br-Bk	Not Used				
Bk-S	T	8			
S-Bk	R				
Y-Bl	Not Used				
Bl-Y	Not Used				
V-S	Data Ground	N/A	N/A	N/A	DPFT – Power Failure Transfer Box
S-V	-24VDC				

Note Indicate if standard telephone, voice mail port, etc.

Power Failure Cut Through (DPFT) Wiring Pin-outs

Table 10-6 DPFT Connector J2/Terminal Sequence & Designations/Station Line Connection

Pair	Pin	Color Code	Lead Designation	Function	PSTU/RSTU PCB Position
1t	26	W-Bl	T	TIP-TEL #1	
R	1	Bl-W	R	RING-TEL #1	
2T	27	W-O	T	TIP-RSTU/RSTU/RDSU #1	
R	2	O-W	R	RING-PSTU/RSTU/RDSU #1	
3T	28	W-G	T	TIP-TEL #2	
R	3	G-W	R	RING-TEL #2	
4T	29	W-Br	T	TIP-RSTU/RSTU/RDSU #2	
R	4	Br-W	R	RING-PSTU/RSTU/RDSU #2	
5T	30	W-S	T	TIP-TEL #3	
R	5	S-W	R	RING-TEL #3	
6T	31	R-Bl	T	TIP-RSTU/RSTU/RDSU #3	
R	6	Bl-R	R	RING-PSTU/RSTU/RDSU #3	
7T	32	R-O	T	TIP-TEL #4	
R	7	O-R	R	RING-TEL #4	
8T	33	R-G	T	TIP-RSTU/RSTU/RDSU #4	
R	8	G-R	R	RING-PSTU/RSTU/RDSU #4	
9T	34	R-Br	T	TIP-TEL #5	
R	9	Br-R	R	RING-TEL #5	
10T	35	R-S	T	TIP-RSTU/RSTU/RDSU #5	
R	10	S-R	R	RING-PSTU/RSTU/RDSU #5	
11T	36	Bk-Bl	T	TIP-TEL #6	
R	11	Bl-Bk	R	RING-TEL #6	
12T	37	Bk-O	T	TIP-RSTU/RSTU/RDSU #6	
R	12	O-Bk	R	RING-PSTU/RSTU/RDSU #6	
13T	38	Bk-G	T	TIP-TEL #7	
R	13	G-Bk	R	RING-TEL #7	
14T	39	Bk-Br	T	TIP-RSTU/RSTU/RDSU #7	
R	14	Br-Bk	R	RING-PSTU/RSTU/RDSU #7	
15T	40	Bk-S	T	TIP-TEL #8	
R	15	S-Bk	R	RING-TEL #8	
16T	41	Y-Bl	T	TIP-RSTU/RSTU/RDSU #8	
R	16	Bl-Y	R	RING-PSTU/RSTU/RDSU #8	
17T	42	Y-O	Spare		
R	17	O-Y	Spare		
18T	43	Y-G	Spare		
R	18	G-Y	Spare		
19T	44	Y-Br	Spare		
R	19	Br-Y	Spare		
20T	45	Y-S	Spare		
R	20	S-Y	Spare		
21T	46	V-Bl	Spare		
R	21	Bl-V	Spare		
22T	47	V-O	Spare		
R	22	O-V	Spare		
23T	48	V-G	Spare		
R	23	G-V	Spare		
24T	49	V-Br	Spare		
R	24	Br-V	Spare		
25T	50	V-S	Spare		
R	25	S-V	Spare		

Table 10-7 DPFT Connector J1/Terminal Sequence & Designations/CO Line Connection & DPFT Control

Pair	Pin	Color Code	Lead Designation	Function	PSTU/RSTU PCB Position
1t	26	W-Bl	T	TIP-CO #1	
R	1	Bl-W	R	RING-CO #1	
2T	27	W-O	T	TIP-PCOU/RCOU #1	
R	2	O-W	R	RING-PCOU/RCOU #1	
3T	28	W-G	T	TIP-CO #2	
R	3	G-W	R	RING-CO #2	
4T	29	W-Br	T	TIP-PCOU/RCOU #2	
R	4	Br-W	R	RING-PCOU/RCOU #2	
5T	30	W-S	T	TIP-CO #3	
R	5	S-W	R	RING-CO #3	
6T	31	R-Bl	T	TIP-PCOU/RCOU #3	
R	6	Bl-R	R	RING-PCOU/RCOU #3	
7T	32	R-O	T	TIP-CO #4	
R	7	O-R	R	RING-CO #4	
8T	33	R-G	T	TIP-PCOU/RCOU #4	
R	8	G-R	R	RING-PCOU/RCOU #4	
9T	34	R-Br	T	TIP-CO #5	
R	9	Br-R	R	RING-CO #5	
10T	35	R-S	T	TIP-PCOU/RCOU #5	
R	10	S-R	R	RING-PCOU/RCOU #5	
11T	36	Bk-Bl	T	TIP-CO #6	
R	11	Bl-Bk	R	RING-CO #6	
12T	37	Bk-O	T	TIP-PCOU/RCOU #6	
R	12	O-Bk	R	RING-PCOU/RCOU #6	
13T	38	Bk-G	T	TIP-CO #7	
R	13	G-Bk	R	RING-CO #7	
14T	39	Bk-Br	T	TIP-PCOU/RCOU #7	
R	14	Br-Bk	R	RING-PCOU/RCOU #7	
15T	40	Bk-S	T	TIP-CO #8	
R	15	S-Bk	R	RING-CO #8	
16T	41	Y-Bl	T	TIP-PCOU/RCOU #8	
R	16	Bl-Y	R	RING-PCOU/RCOU #8	
17T	42	Y-O	Spare		
R	17	O-Y	Spare		
18T	43	Y-G	Spare		
R	18	G-Y	Spare		
19T	44	Y-Br	Spare		
R	19	Br-Y	Spare		
20T	45	Y-S	Spare		
R	20	S-Y	Spare		
21T	46	V-Bl	Spare		
R	21	Bl-V	Spare		
22T	47	V-O	Spare		
R	22	O-V	Spare		
23T	48	V-G	Spare		
R	23	G-V	Spare		
24T	49	V-Br	Spare		
R	24	Br-V	Spare		
25T	50	V-S	PFT DG	PFT GROUND (INPUT)	RDSU/RSTU/PSTU/PIN50
R	25	S-V	PFT -24V	PFT -24V (INPUT)	RDSU/RSTU/PSTU/PIN25

CO Line Wiring Diagrams

RGLU2, RCOU or PCOU Wiring

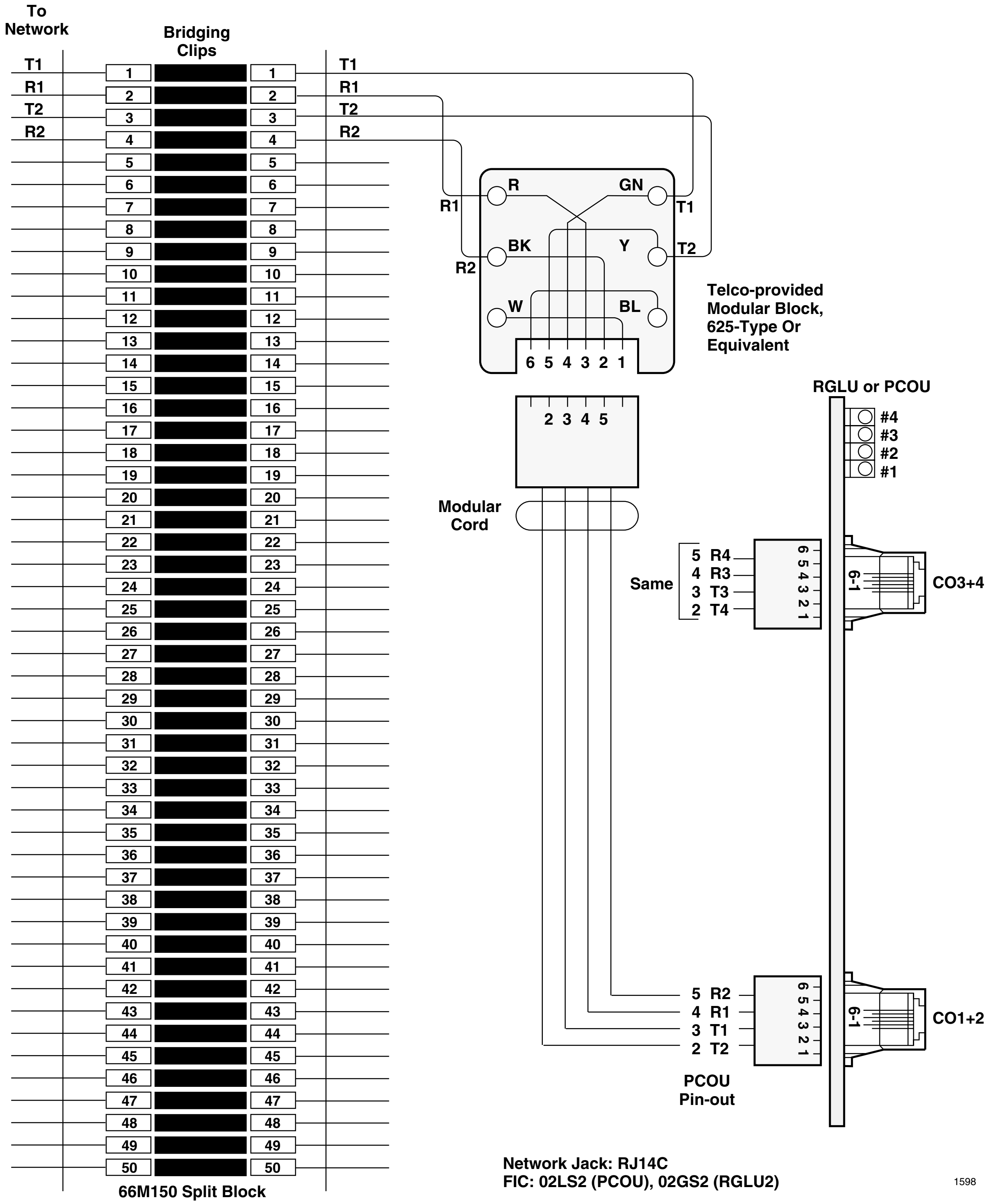


Figure 10-9 RGLU2, RCOU or PCOU Wiring

Table 10-8 CO Line (RCOU/RCOS, RGLU2, RDDU, PEMU, REMU, RDDU, RDTU) MDF Cross Connect Record

MDF Block Number	CO Line Number	PCB Type and Cabinet Slot Number	MDF Block Number	CO Line Number	PCB Type and Cabinet Slot Number	MDF Block Number	CO Line Number	PCB Type and Cabinet Slot Number

RCOU/RCOS Wiring

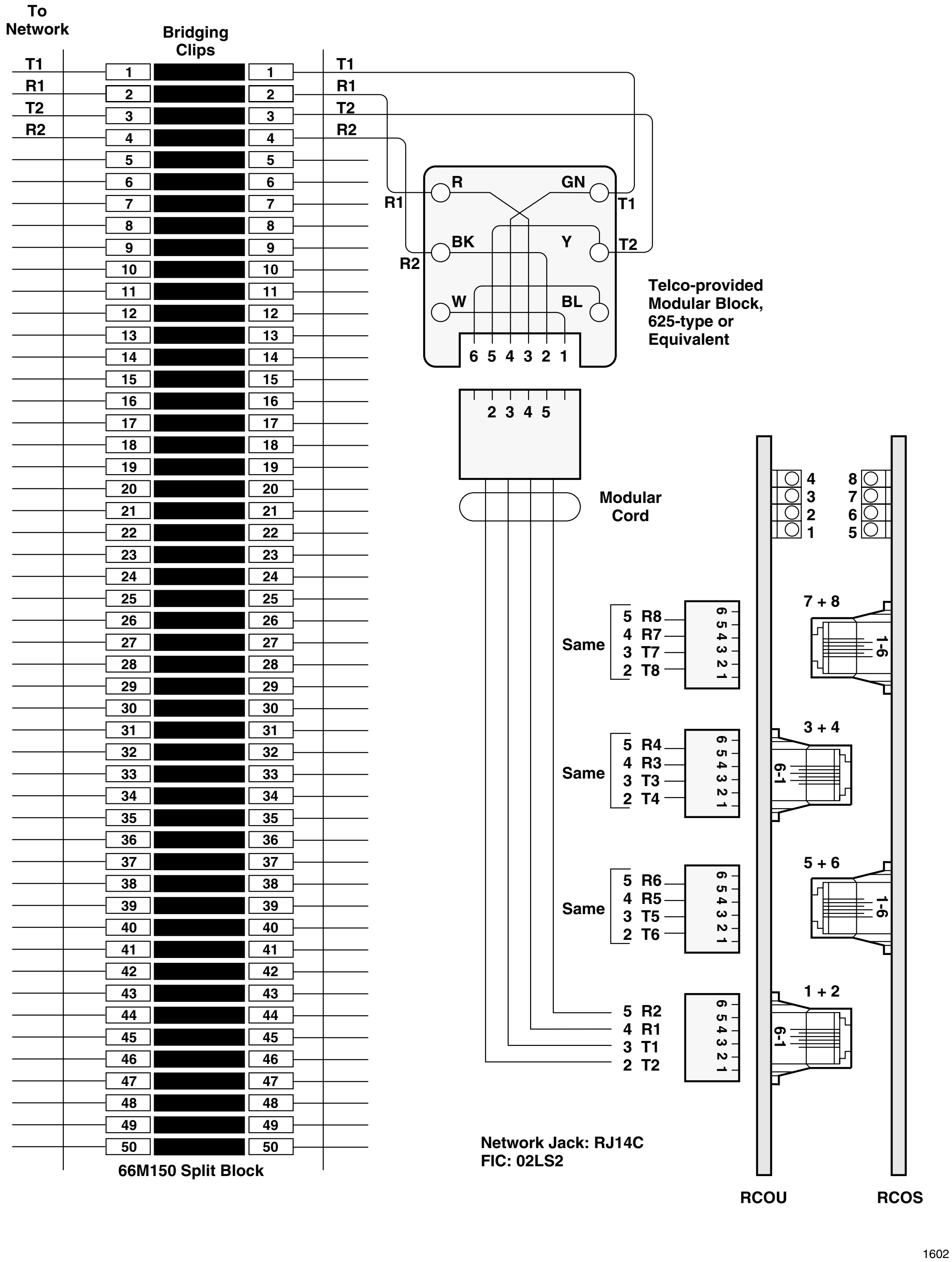


Figure 10-10 CO to RCOU Wiring

RMCU/RMCS Wiring Diagram

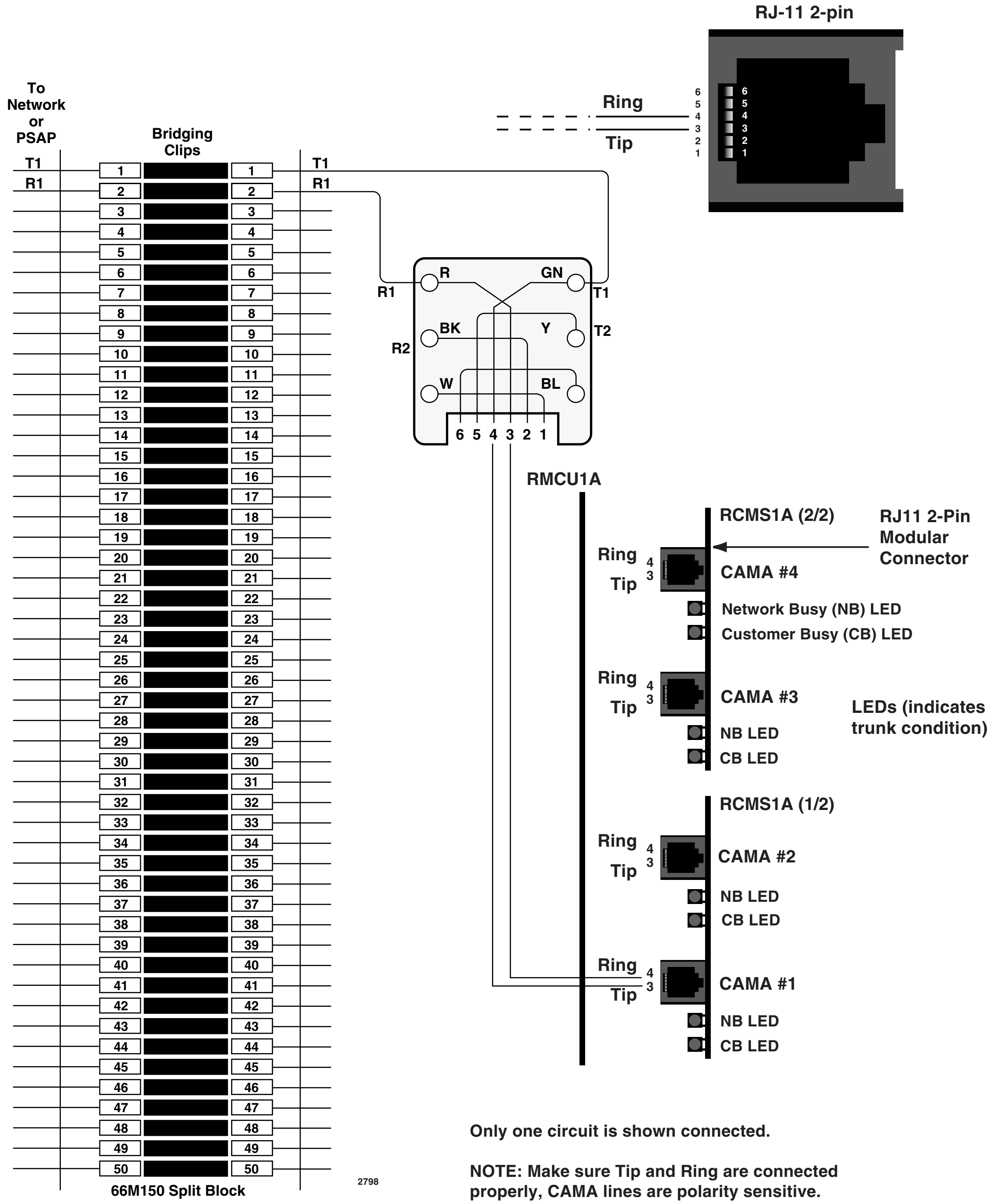
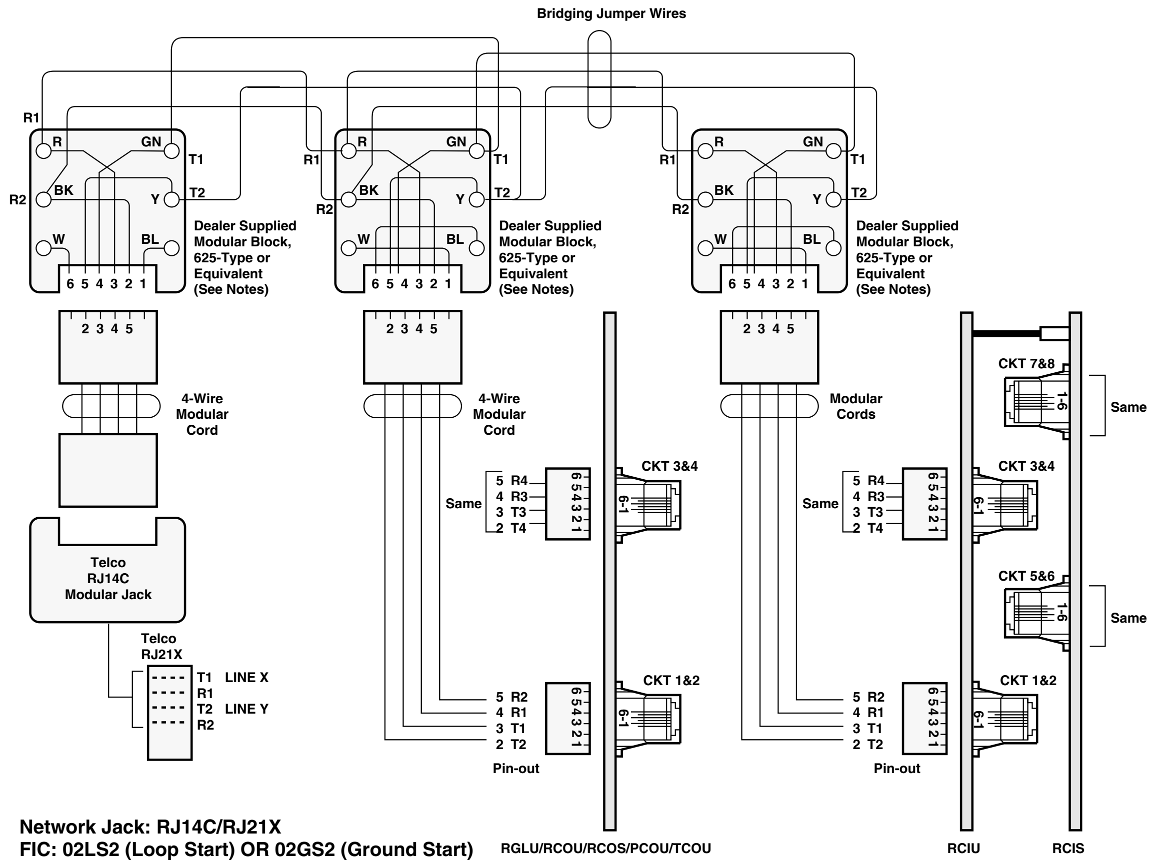
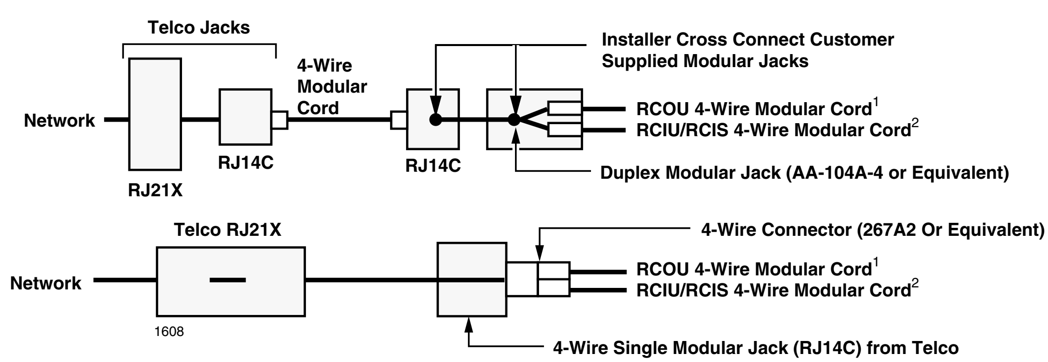


Figure 10-11 RMCU/RMCS Wiring Diagram

RCIU1/RCIS or RCIU2/RCIS Wiring





Note 4-wire modular jacks such as graybar part number AA-104A-4 could be used in place of the two modular jacks; or, a T-connector such as graybar part number 267A2 Adaptor could be used.

Figure 10-12 RCIU1/RCIS or RCIU2/RCIS MDF Wiring Diagram

DID and Tie Line Wiring

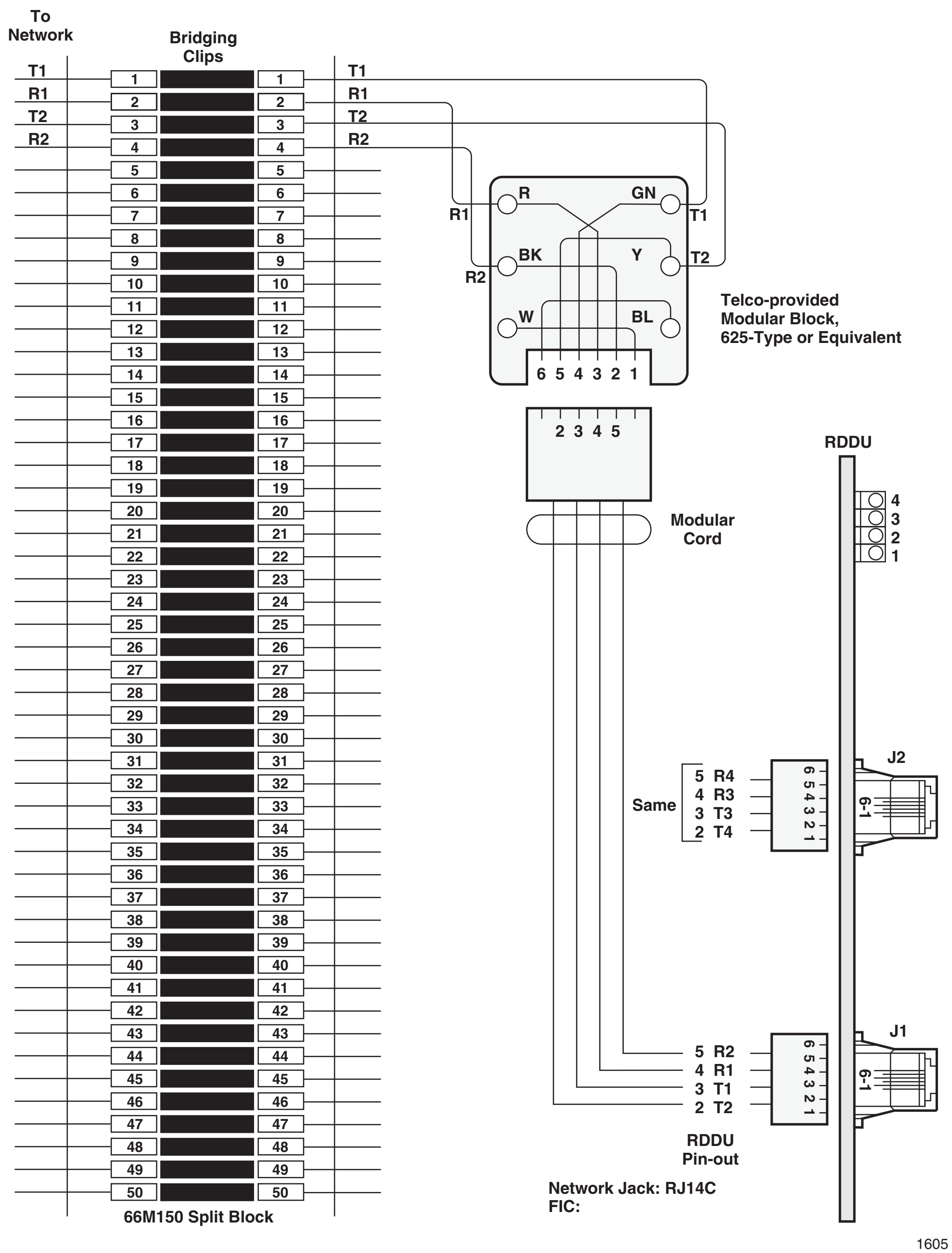


Figure 10-13 MDF Wiring/DID CO Lines to RDDU

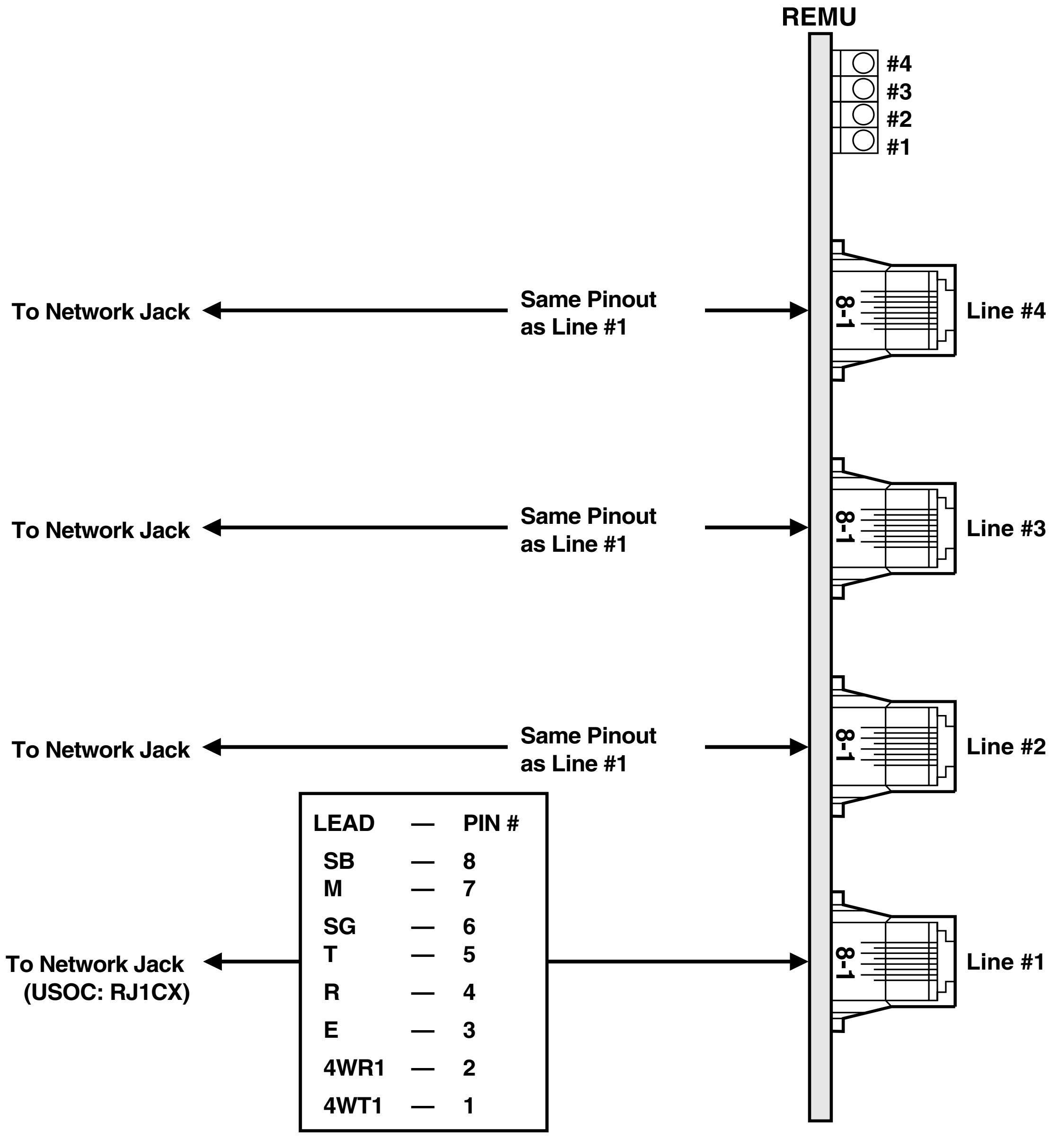


Figure 10-14 MDF Wiring REMU 2/4 Wire Type I/II

PEMU Wiring

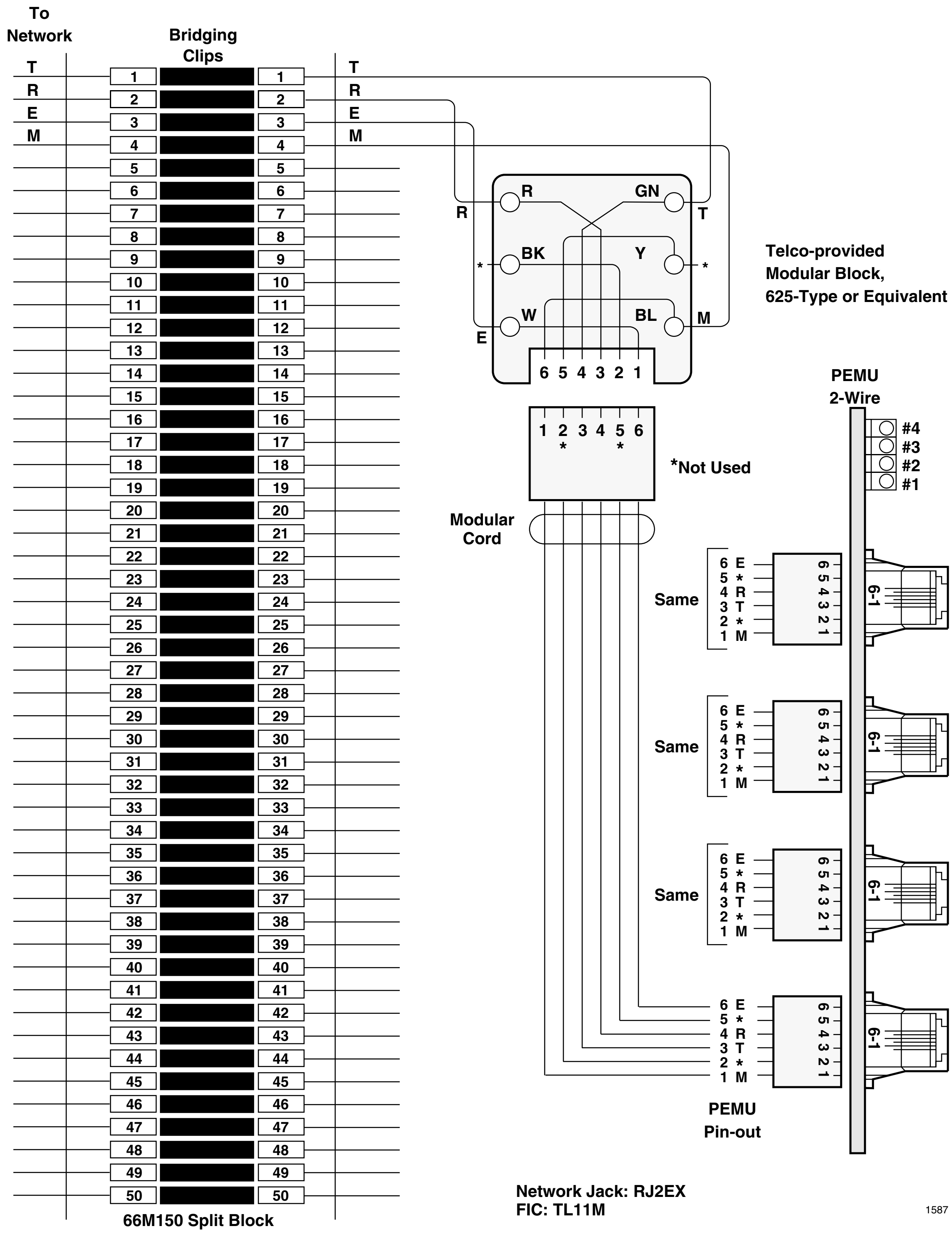
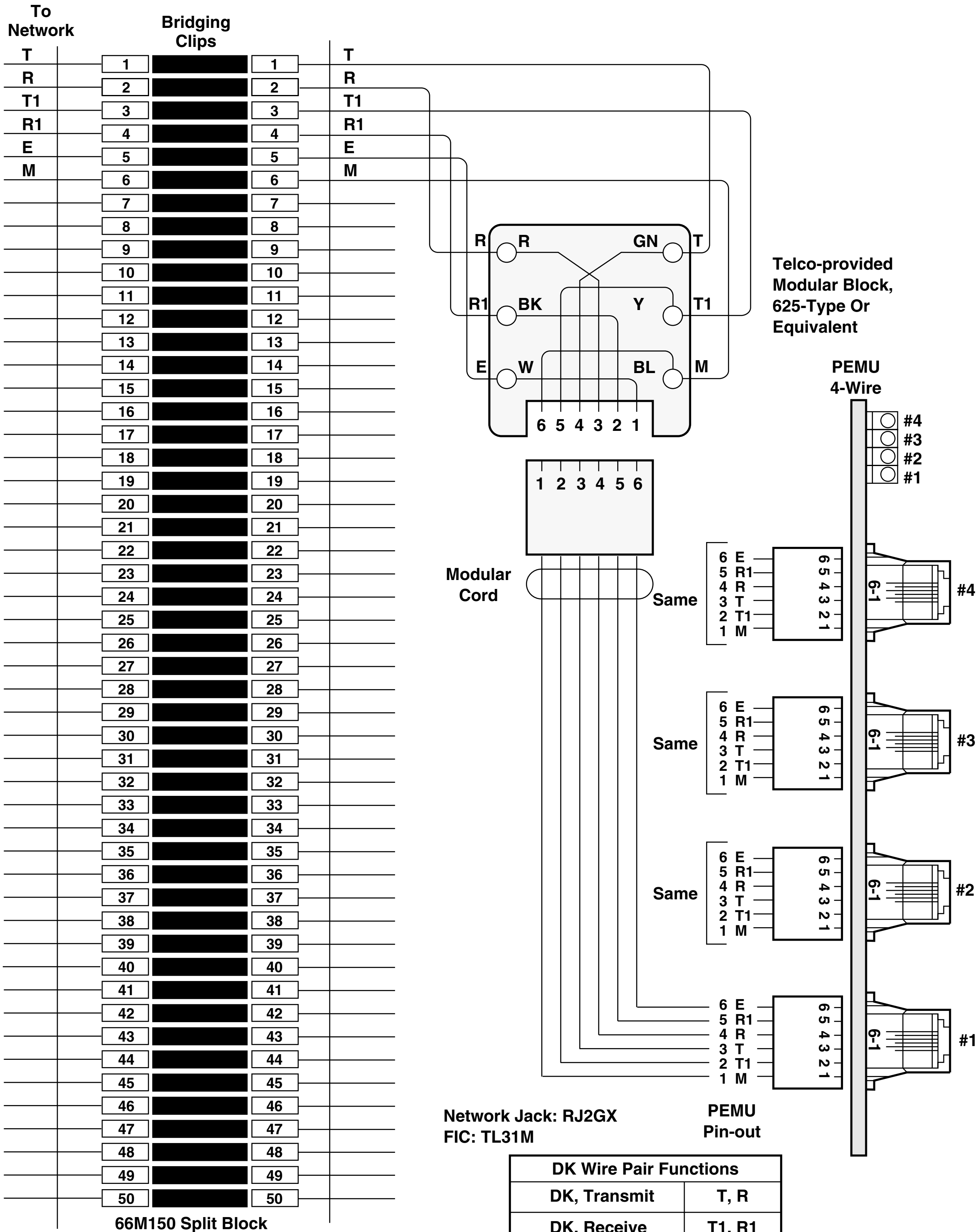


Figure 10-15 MDF Wiring/2-Wire Tie Line to PEMU



DK Wire Pair Functions	
DK, Transmit	T, R
DK, Receive	T1, R1
Signaling	E, M

Figure 10-17 MDF Wiring/4-Wire Tie Line to PEMU

Option Interface PCB Wiring Diagram

This section covers wiring for the option interface PCB, the BIOU, which enables external paging, Night Bell, Night Transfer, Door Lock and BGM mute control. For more information and connection diagrams, see "External Page with BIOU Interface" on page 12-10.

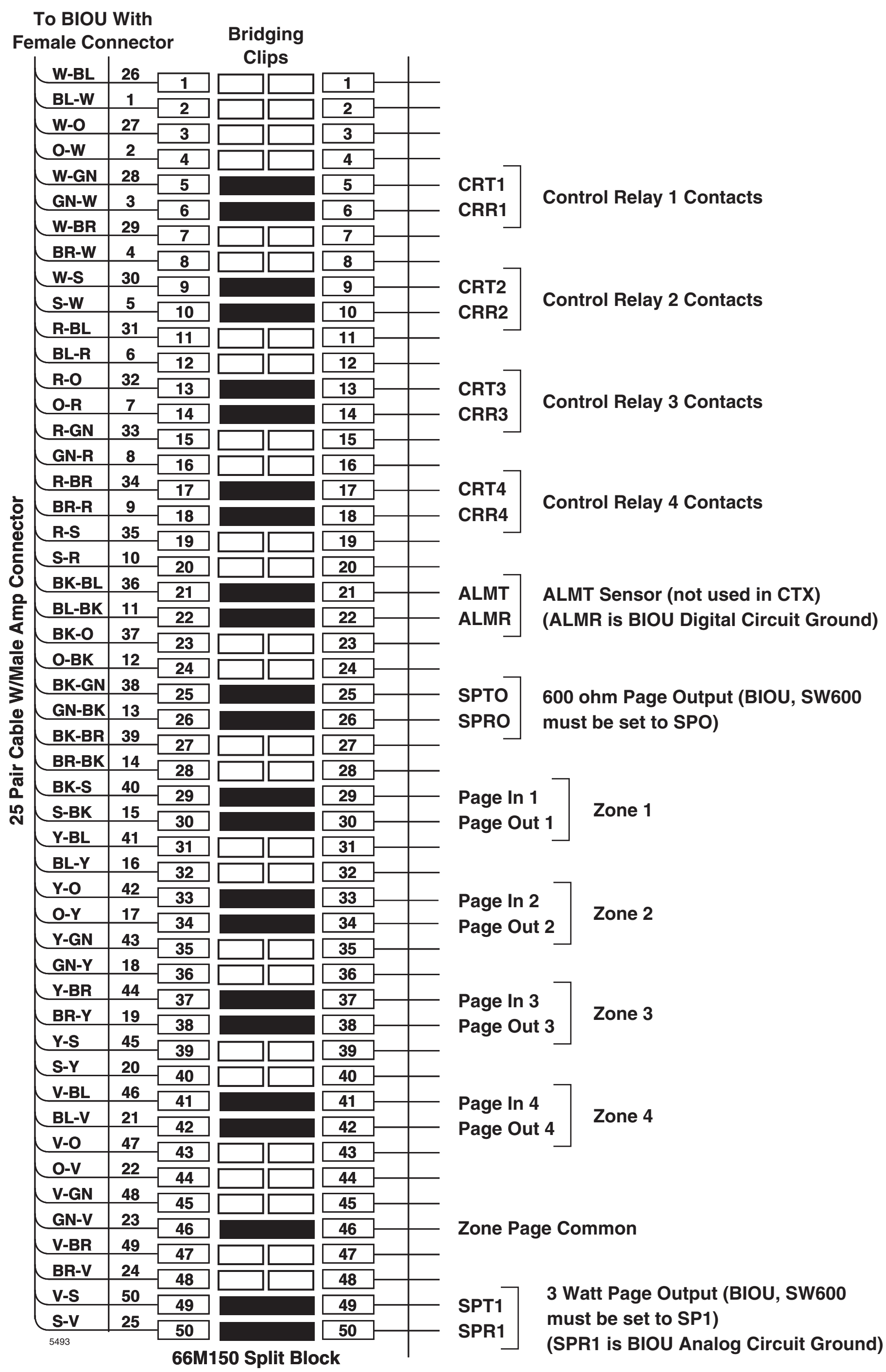


Figure 10-18 MDF Wiring to BIOU

Station Apparatus 11

This chapter provides instructions on how to connect telephones to the Strata CTX systems and how to configure and upgrade them for optional features.

The Strata CTX systems can support Toshiba corded and cordless digital telephones, as well as most standard telephones provided by other suppliers. The digital telephone information in this chapter applies to the 3000-series and 2000-series telephones that connect to the PDKU, ADKU or BDKU/BDKS interface.

Strata CTX does not support Toshiba electronic telephones (EKT) or other devices supported by the PEKU and PESU interface PCBs. For information on earlier models, refer to the appropriate *Strata DK manual.* Procedures for installing direct station selection consoles and add-on modules also appear in this chapter.

Note Strata IP telephones are discussed in the IPT chapter of this document.

3000-series Digital Telephones Telephone

The 3000-series digital telephone (DKT) models consist of:

- DKT3010-S (10-button speakerphone model which enables users to make and receive outside and internal calls without lifting the handset)
- DKT3020-S (20-button speakerphone model which enables users to make and receive outside and internal calls without lifting the handset)
- DKT3010-SD (10-button speakerphone model equipped with an LCD that displays two rows of 24-characters. The speakerphone enables users to make and receive outside and internal calls without lifting the handset.)
- DKT3020-SD (20-button speakerphone model equipped with an LCD that displays two rows of 24-characters. The speakerphone enables users to make and receive outside and internal calls without lifting the handset.)
- DKT3014-SDL (14-button speakerphone model equipped with 16 buttons for LCD soft keys and a large LCD. The large LCD accommodates up to eight rows of 24 characters on a screen which tilts for easy viewing.)
- DKT3001 (single line, digital telephone that enables users to make and receive outside and internal calls using the handset.)

3000-series Telephone Installation

Digital Telephone System Connection

The following provides information on how to connect all 3000-series DKTs to the Strata CTX systems. 3000-series DKTs can be connected to the BDKU/BDKS and/or the PDKU interface PCB. To obtain all capabilities, the DKT3000-series telephone must be connected to the BDKU/BDKS. For details on feature availability per station PCB, see Table 11-1.

Table 11-1 DKT3000 Operation with Strata CTX and DK Systems

DKT3000 Telephone and Feature	Strata CTX System with BDKU/BDKS	Strata CTX system w/ PDKU and DK System w/ PDKU or BDKU
DKT3020/3010 Basic LCD	2 x 24 characters	2 x 16 characters, left-justified
DKT3014 Large LCD	8 x 24 characters with VM and Directory Dial softkeys	2 x 16 characters, left-justified, no VM and Directory Dial softkeys
LCD Feature button	Operational	Not operational
Fixed Spdial button	Operational	Not operational
DKT3000 telephones per cabinet slot	16 telephones max.	8 telephones max.
DKT3000 Programming Mode “A” (Beep Tone On/Off, etc.) Program Mode “A” is for telephone options that are controlled by the ROM inside the telephone.	Operational	Operational
DKT3000 Programming Mode “B” (Flexible Buttons, One Touch, etc.) Program Mode “B” is for telephone options controlled by the Strata CTX670 processor and database memory. (See the *Strata CTX DKT3000/2000-series Digital Telephone User Guide*.)	Operational	Strata CTX with PDKU is operational. DK system with PDKU or BDKU is not operational.

Before installing any telephone wiring, read the following warning and caution notes:

WARNING!

- **Never install the telephone wiring during a lightning storm.**
- **Never install the telephone jacks in wet locations, unless the jack is specifically designed for wet locations.**
- **Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.**
- **Use caution when installing or modifying telephone lines.**
- **If telephone, DSS console, door phone control box, or door phone wiring exits the building, external secondary protection is required. See Chapter 10 – MDF PCB Wiring.**

CAUTION! **When installing the station cable, do not run the cables parallel if they are within three feet of an AC power line. AC power lines should be crossed at right (90°) angles only. In particular, avoid running station wire pairs near devices that generate electrical noise, such as neon or fluorescent light fixtures.**

CAUTION! **Do not use cleansers that contain benzene, paint thinner, alcohol or other solvents on the telephone's rubber feet. The color of the rubber may transfer to the desk or mounting surface.**

Digital telephones connect to the digital telephone ports via the MDF with standard twisted-pair jacketed telephone cable. If using 24 AWG cable, single-pair wiring is sufficient in most cases for digital telephones to operate effectively at up to 1000 feet from the system.

Digital telephones that are equipped with ADMs should have two-pair (or external power) to function effectively at this distance. This also applies to digital telephones supported by systems that must operate with battery reserve power (see Chapter 4 – Strata CTX670 Installation for more information).

To accommodate the digital telephone line cord, the cable should be terminated in a modular station connector block (RJ11) at the station location. The standard single-pair, modular digital telephone cord that is sent with the telephone is 7 ft. (the maximum allowed is 25 ft.).

Notes

- Digital telephone cable runs must not have cable splits (single or double), cable bridges (of any length), or high resistance or faulty cable splices.

3000-series Telephone Option PCBs

Digital telephones can be upgraded with option PCBs to add a number of features. Each of these upgrades shares a circuit with the telephone that it is connected to and is not considered a station. See Table 11-2 for more information.

Table 11-2 3000 Telephone Subassembly Upgrades

Subassembly	No. per Phone	Function
BVSU[1]	1	**Speaker Off-hook Call Announce (OCA):** Provides interface for digital telephone to receive Speaker OCA. Not required for Handset/Headset OCA.
BHEU or HHEU	1	**Headset and external ringer telephone interface**: Can be installed with BVSU, BPCI or DADM. (See "Telephone Headset (BHEU) Upgrade" on page 11-7 for installation instructions.)
BPCI	1	**TAPI PC application and data calling interfaces.**
DADM3020[1]	1 or 2	**Add-on Module (ADM):** Provides telephone with 20 (or 40 with two ADMs) additional feature buttons.

1. Only one of these options is allowed per telephone: BVSU, BPCI or DADM.

Some of the option PCBs are compatible, meaning that more than one option can be added to a telephone. The following table shows which options are compatible.

Table 11-3 Station Option Interface PCB Compatibility

Item	BPCI	BHEU/ HHEU	BVSU	ADM
BPCI		X	NC	NC
BHEU/HHEU	X		X	X
BVSU	NC	X		NC
ADM	NC	X	NC	

X = Compatible, can be used together in the same telephone.

NC = Not compatible, cannot be used together in the same telephone.

Option PCBs must be compatible with type of telephone (i.e., 3000- or 2000-series) they are installed in (see Table 11-4 for compatibility).

Table 11-4 DKT3000 and DKT2000 Component Compatibility

Item	2000-series DKT	3000-series DKT
Add-on Modules	DADM2020 only	DADM3020, DADM3120
Desktop Computer Telephony Interface (CTI)	n/a	BPCI only
Speaker OCA	BVSU or DVSU	BVSU only
Tilt Stands	BTSD for DKT	BTSD for DKT and BTSA for DKT with ADM(s)
Item	**2000- and 3000-series DKTs**	
Headset Interface	HHEU2 and BHEU	
External Ringer	HHEU2/HESB and BHEU/HESB	
Cordless Telephones	DKT2104 and DKT2004. When these cordless telephones are connected to a DKT3000, the DKT3000 must be placed in DKT2000 mode (see “DKT2000 Mode On/Off” on page 11-19).	

Telephone Speaker Off-hook Call Announce Upgrade (BVSU)

To receive Speaker Off-hook Call Announce (OCA) calls over the digital telephone speaker, a digital telephone must be upgraded with a BVSU; the telephone making the call does not require a BVSU. Digital telephones do not require an additional wire pair to receive Speaker OCA call. The BVSU is not necessary to receive handset OCA.

BVSU Upgrade Installation for DKT3000-series Telephones

1. Loosen the four captive screws on the telephone base and remove the base (see Figure 11-2).
2. On the BVSU (see Figure 11-1, set strip pins SW1 and SW2 per Table 11-5.

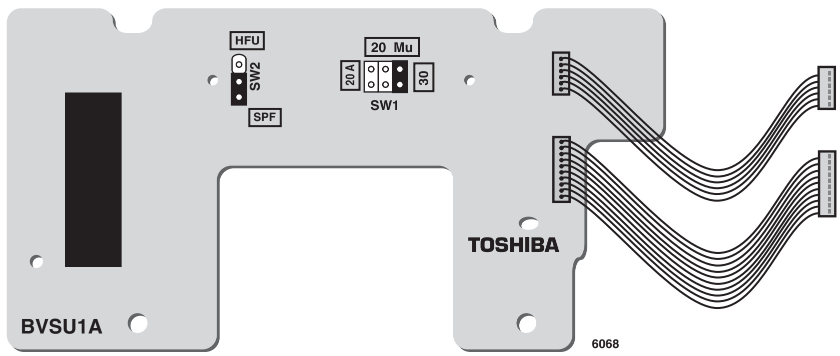


Figure 11-1 Speaker Off-hook Call Announce Upgrade (BVSU1A)

Table 11-5 BVSU Jumper Settings

Control/Indicator/ Connector	Type of Component	Description
SW1	6-terminal jumper plug	30 (default) - use for DKT3000 telephones. 20 Mu - use for DKT2000 telephones in Mu Law countries, including U.S. and Canada. 20A - use for DKT2000 in A Law countries.
SW2	3-terminal jumper plug	SPF (default setting). Use for all DKT3000 DKT2000 telephones, except the DKT2010-H. HFU - use for DKT2010-H telephones.

3. Slide the BVSU under the tabs.
4. Position the BVSU holes over the standoffs and secure with the two provided screws. (Two large head screws for DKT3000s, four smaller head crews for the DKT2000.)
5. Connect the BVSU wire plugs to the two “PCI/VSU” connectors on the PCB inside the phone, with the red wire on the side where “RED” is silk-screened on the DKT PCB (see Figures 11-7 and 11-8).
6. Reinstall the telephone base and secure it with its four captive screws

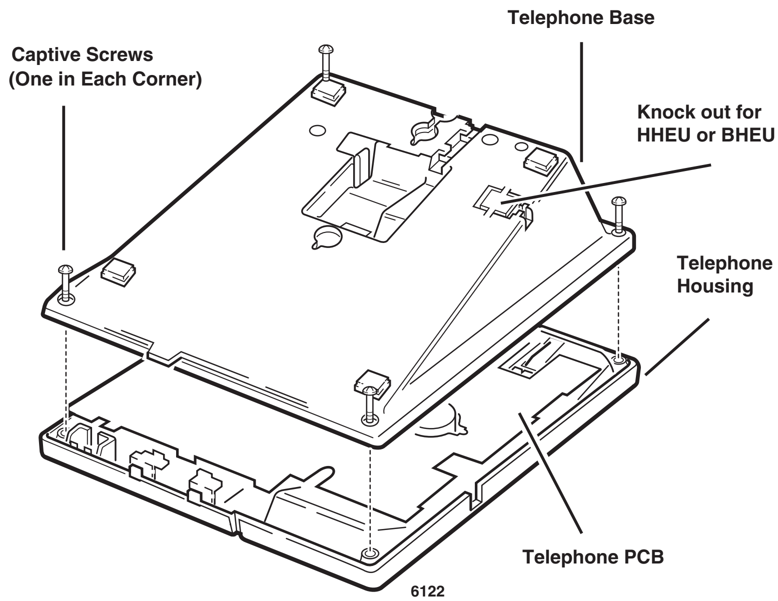


Figure 11-2 Removing Telephone Base

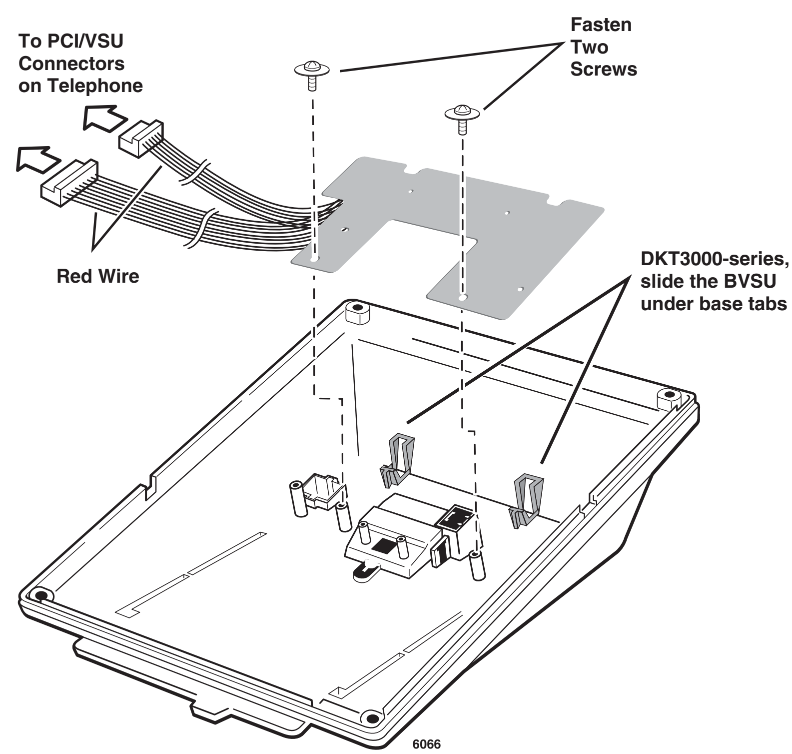


Figure 11-3 BVSU Installation

Telephone Headset (BHEU) Upgrade

The BHEU can be installed into the DKT3000-series telephones to enable headset or external ringer use. For information on connecting the external ringer, refer to "Telephone (BHEU) to External Speaker (HESB) Cable Connection" on page 12-18. The BHEU can also be installed into DKT3010 and DKT3020 telephones that have either a BVSU or BPCI installed. For DKT3001 and DKT3014 telephones, the installation is same as below, only the connector location is different.

BHEU Installation

1. Loosen the four captive screws on the telephone base, and remove the base. Knock out hole for the BHEU cord (see Figure 11-2).
2. If you are connecting an ECM or Carbon-type headset to the BHEU, leave the BHEU jumper in the "AUTO" position (see Figure 11-4).

   "AUTO" enables the BHEU current detector to determine which headset type is connected (less than 2mA detects EMC and more than 2mA detects Carbon). If, in a rare case the current is marginal using a carbon headset (only) and performance is not adequate, set the jumper to "CARBON."

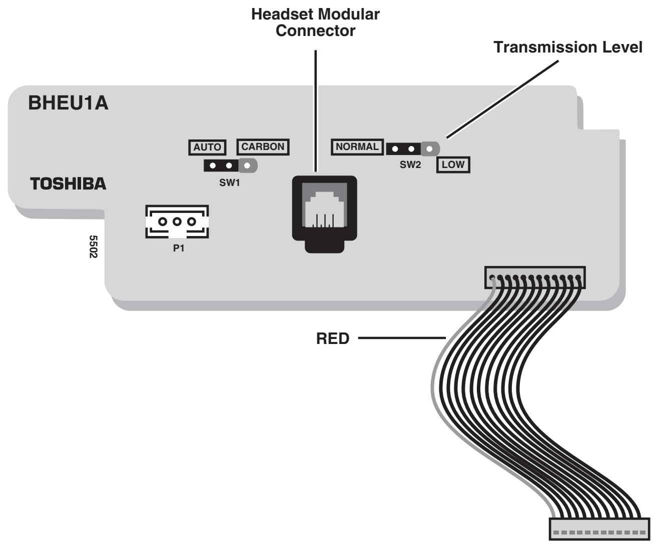


Figure 11-4 BHEU PCB

3. Make sure that the SW2 jumper plug is set to "NORMAL."
4. If you do not want the handset receiver to work when the handset is on-hook and a headset (connected to BHEU) is being used, cut the HEU strap on the DKT PCB (see Figures 11-7 and 11-8).
5. Position the BHEU PCB (component side down) on the standoffs inside the base, and secure with the two provided screws (see Figure 11-5).
6. Connect the BHEU integrated wire plug to P3 (HEU) on the telephone base PCB (see Figures 11-6 and 11-9). Note the location of the red wire.

   ...or for DKT3001 telephones only, connect the BHEU wire plug to P1 (HEU) on the telephone base PCB (see Figure 11-9). Note the location of the red wire.
7. Reinstall the base on the telephone.

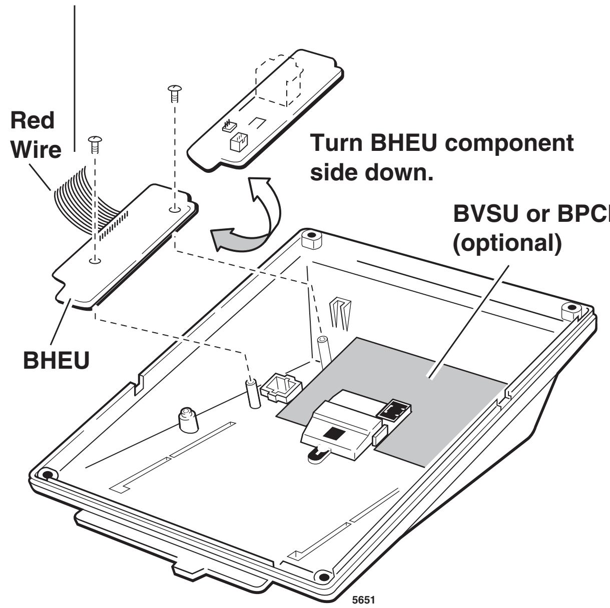


Figure 11-5 BHEU Installation

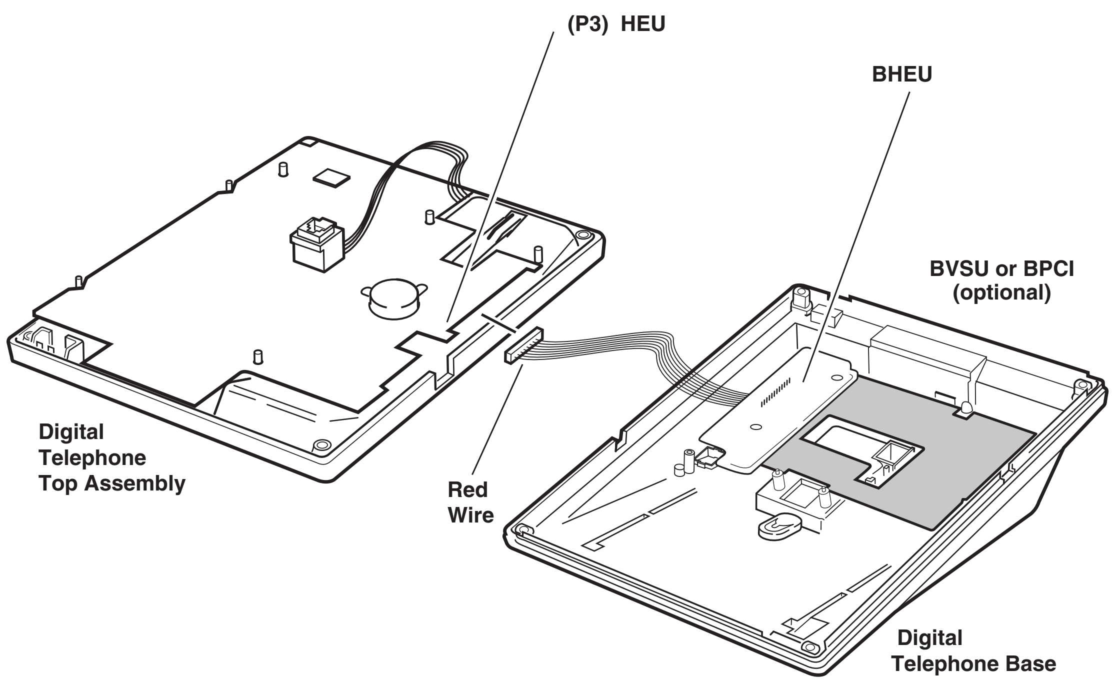


Figure 11-6 BHEU Installation

Telephone Option Straps

Certain option straps on the DKT3000-series phones must be cut when installing carbon handsets, external power or headsets. Refer to Table 11-6 and Figures 11-7~11-9 for further instruction.

Table 11-6 Station Option Interface PCB Compatibility

Name of the Strap on the DKT PCB	DKT3010-S, DKT3020-S, DKT3010-SD, DKT3020-SD	DKT3014-SDL	DKT3001	Explanation
Carbon	W301, W302	W301, W302		If a carbon-type handset or carbon-type headset is connected to the *handset* jack, the carbon wire jumper straps, listed on the left, must be cut inside the telephone. When a carbon headset is connected to the BHEU, you do *not* need to cut the straps. See Figures 11-7~11-9.
HEU	W303	W303	W103	To turn off the handset receiver when the handset is on-hook and a headset is used with the BHEU, cut the “HEU” strap shown on the left.
EX.POWER	W101, W102	W101, W102	W101, W102	Cut the “EX.POWER” straps only when external power is connected to the second pair (pins 2 and 5) of the telephone modular jack. See Figures 11-7~11-9.
SET UP	W401, W402	W401, W402		Do not cut – for factory use only.

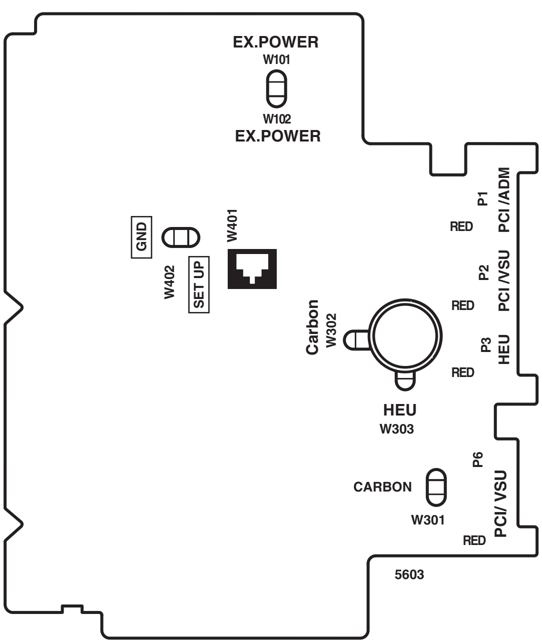


Figure 11-7 DKT3010, DKT3020 Strap and Connector Locations

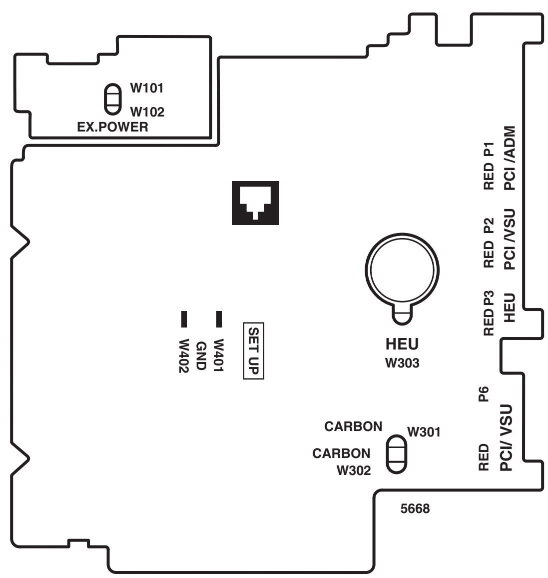


Figure 11-8 DKT3014 Strap and Connector Locations

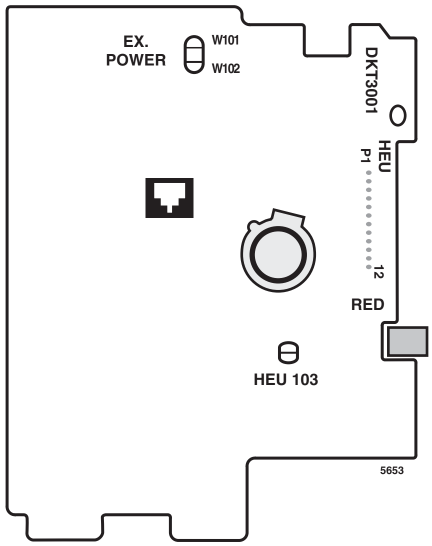


Figure 11-9 DKT3001 BHEU Connector Location

TAPI and Simultaneous Voice and Data Upgrades for 3000-series Telephones (BPCI)

Digital telephones can be upgraded with a Personal Computer Interface (PCI) to provide desktop interface with the telephone and PC USB port. The PC connected to the BPCI can place telephone calls, receive Caller ID, ANI, and DNIS information. The BPCI is compatible with Microsoft TAPI application programs.

BPCI Installation

1. Loosen the four captive screws on the digital telephone base to remove it. Knock out the plastic cover on the telephone base to provide access to the BPCI USB port. See Figure 11-10.
2. Refer to Figure 11-10 and install the BPCI inside the phone base. Secure with screws.
3. Insert the three integrated unit wire plugs into connectors P1, P2 and P6 on the PCB in the telephone. Make sure that the red wire is positioned as shown. (P1-P1, P2-P2, P6-P4.)

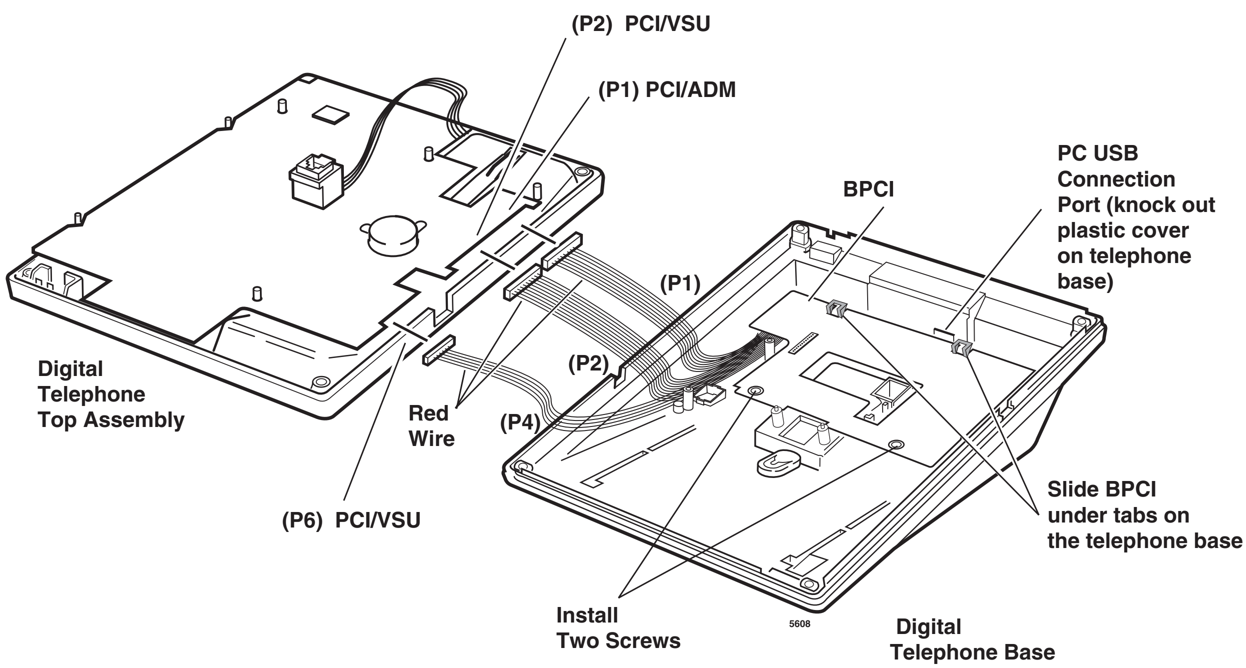


Figure 11-10 BPCI Installation

4. Stick the USB label onto the base, just below the modular cord port (see Figure 11-11).

Important!

- *BPCI requires a DKT3000-series telephone set in the DKT3000 mode (see "DKT2000 Mode On/Off" on page 11-19).*
- *The BPCI also requires that the DKT3000-series telephone be connected to a BDKU or BDKS PCB set to the "BDKU" mode (not the "PDKU" mode). BPCI will not function on a telephone connected to a PDKU or RDSU PCB.*

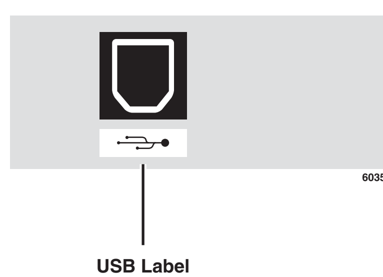


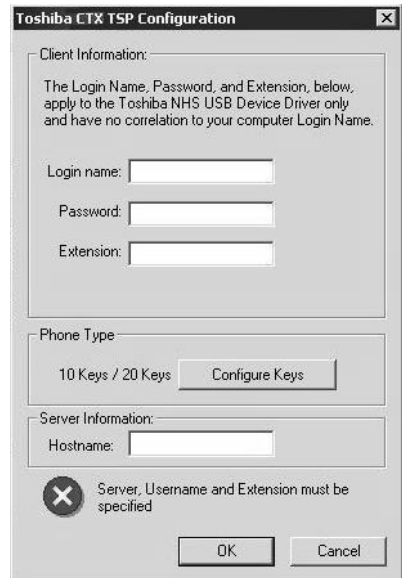
Figure 11-11 USB Label

Station Apparatus

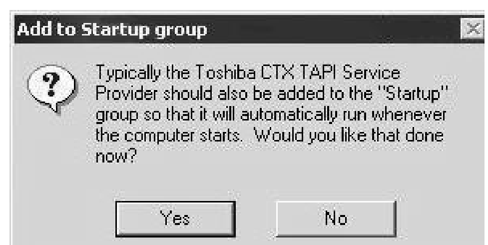
Install TAPI Service Provider

This *Desktop Open Application Interface (OAI) Manual* provides step-by-step instructions for installing the software application.

1. Insert the Strata CTX CD-ROM into your CD-ROM drive. From the Main Menu, click Install TSP.
2. Follow the on-screen instructions. Toshiba recommends that default settings be used, but alternate paths, program groups, etc., are offered to meet your specific needs.
3. When the Toshiba CTX TSP Configuration screen displays (shown right), type in the following information:
    - Login Name: Use any name you desire.
    - Password: Optional, leave blank if not needed.
    - Extension: Primary DN of connected DKT3000 phone.
    - Hostname: Typically this is “localhost.”
4. (Optional) Click on Configure Keys. This section enables you to use more useful names for the line appearances on your phone. If you do not change their name, an application will show the line appearances as FB1 through FB20. Only the 20 feature keys of the main phone can be selected for TAPI dialing, using a specific appearance.
5. Click OK to save your entries. An error box displays and you need to click OK again.



6. Click Cancel on the Toshiba CTX TSP Configuration screen to continue. The Add to Startup group screen displays (shown right).
7. If you want the Toshiba CTX TAPI Service Provider program added to the Startup group, click Yes.
8. The installation continues. On the last screen, click Finish.
9. Restart PC to complete the installation.



Add/Edit TSP Configuration Information

1. Select Start > Setting > Control Panel. Select either the Telephony or Phones and Modems (name is dependant upon the operating system used).
2. Select Advanced Tab to see a current list of providers. If “Toshiba CTX TAPI Service Provider” is not found, click ADD, select it and click OK.
3. Highlight “Toshiba CTX TAPI Service Provider” and click Configure. Enter/Edit the information on the screen (see Steps 3 and 4 above for additional information).
4. When finished, click OK > Close.

Test/Use TAPI Service Provider

An easy way to test or use your TAPI Service Provider is to use “Phone Dialer” supplied in most Windows® operating systems. This program is typically found in “Accessories/Communications/Phone Dialer.”

1. From the Main Menu, select Edit/Options.
2. In the Line Tab choose the Phone option for Preferred Line for Calling.
3. In Line used for Phone Calls, pull-down the list and select the appropriate line to use when making a call. For example:

   Toshiba CTX TSP Ext. 3351, Address 0 is typically the primary DN for extension 3351

IPT Telephone

Toshiba offers an Internet Protocol (IP) Telephone model, the IPT1020-SD. The BIPU-M2A PCB IP telephone interface must be installed in the Strata CTX100 or CTX670.

The IPT1020-SD is a 20-button speakerphone model equipped with an LCD that displays two rows of 24-characters. The speakerphone enables users to make and receive outside and internal calls without lifting the handset. A full-duplex speakerphone is not supported.

The IPT has the following features:

- Full DKT feature set (except Speaker OCA)
- DKT Anywhere
- Automatic Configuration
- Terminal Authentication (security)
- Digital Add-on Modules (DADM3120)
- Built-in headset interface for headsets and external speaker connection (HESB)
- See Chapter 9 – IP Telephony and QSIG Over IP for more information on IPTs, the DADM31020 and the BIPU-M2A PCB.

3000-series, IPT1020-SD Button Layouts

The button layout for the 3010- and 3020-series telephones and IPT1020-SD telephone are shown in Figure 11-12. The DKT3014, large LCD telephone has additional buttons for features and programming (see Figure 11-13).On the DKT3001, the Msg and Flex buttons are programmable (see Figure 11-14).

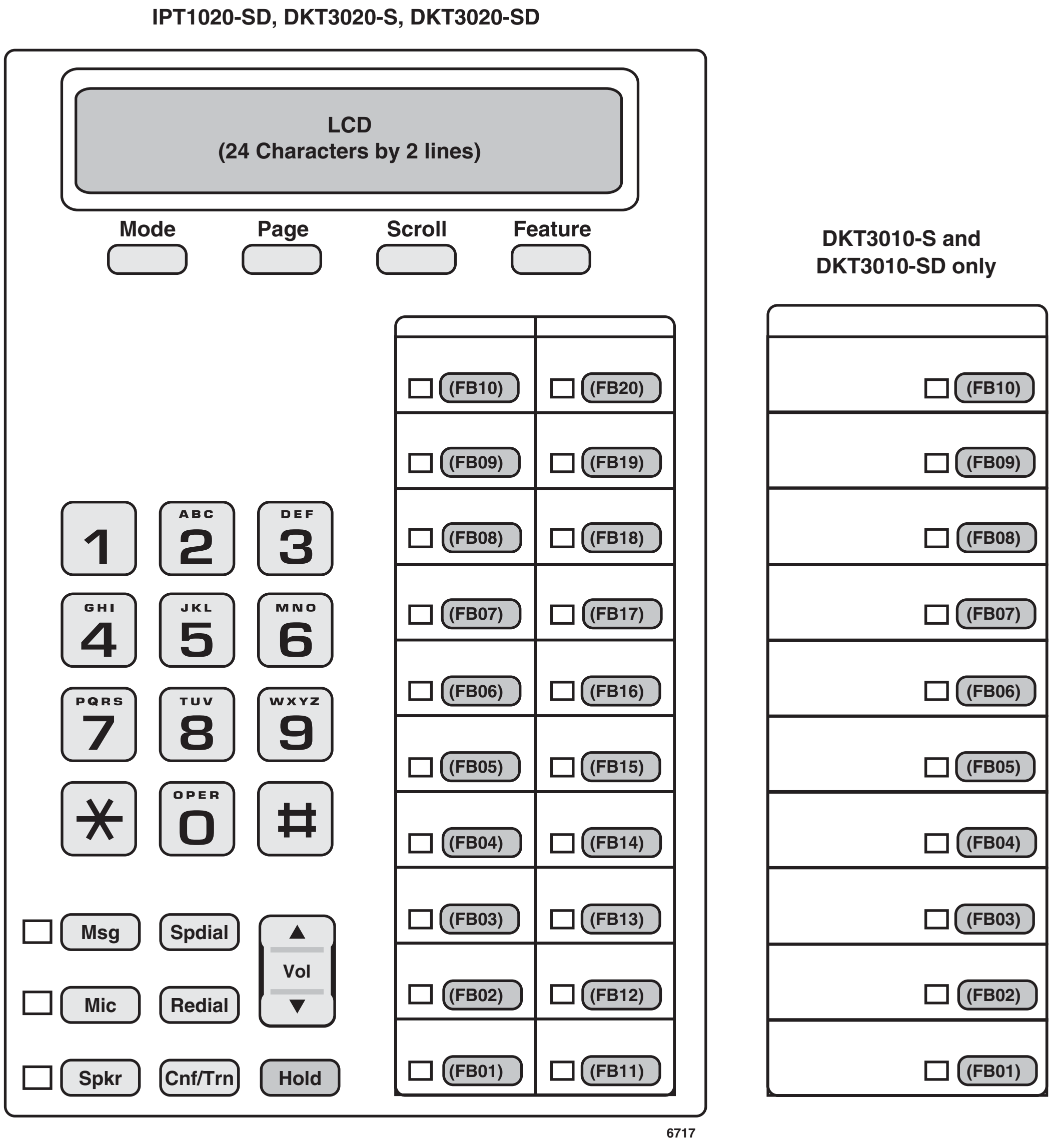


Figure 11-12 DKT3010/3020 and IPT1020-SD Button Telephones

FB buttons for 14-button phones

DKT3014-SDL

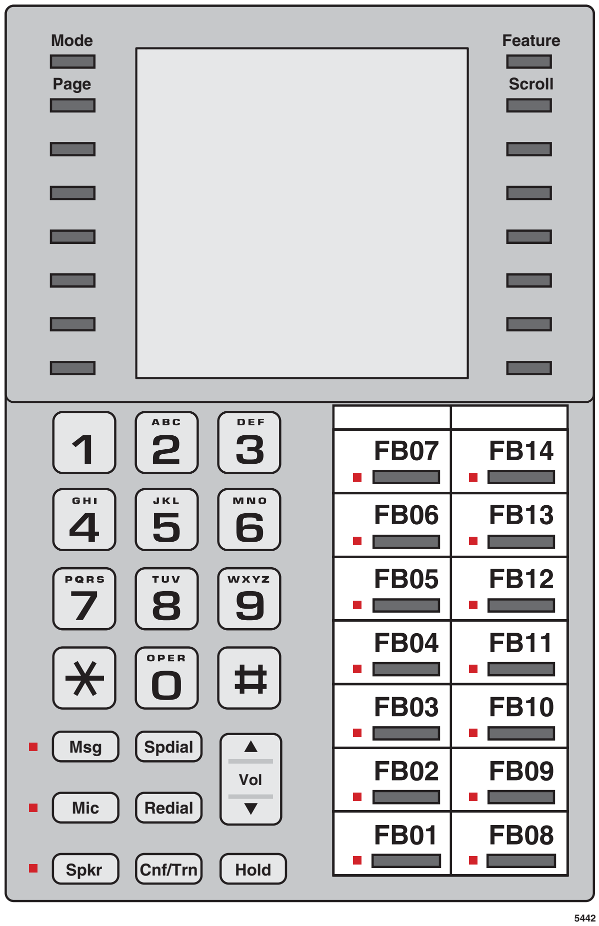


Figure 11-13 DKT3014-SDL Buttons

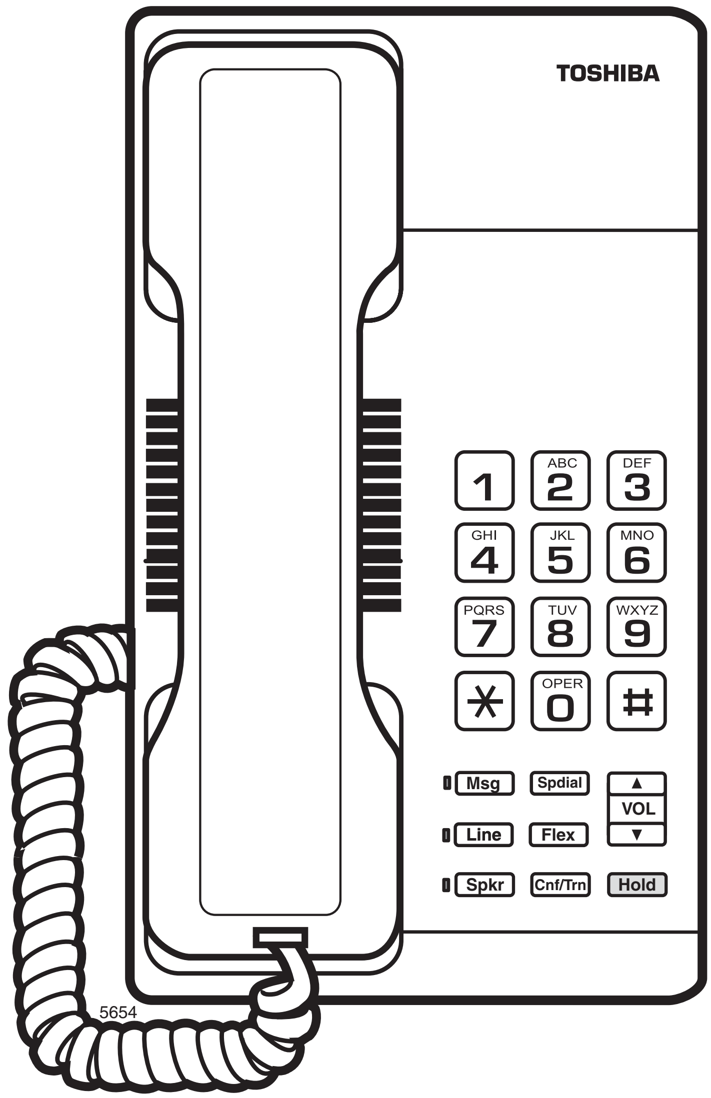


Figure 11-14 DKT3001 Buttons

Telephone Settings

3000-Series/IPT Telephones

Telephone Programming Mode A

The 3000-series telephones enable you to set a number of features directly from the phone, including: Call Waiting Tone (On/Off), Flex Key, Msg Key, LCD contrast, Speakerphone/ Microphone Room Noise Sensitivity (On/Off), and Country settings. “Telephone Programming Mode A” programs settings on a ROM chip inside the telephone.

Note Some of the procedures use Feature Buttons (FB1, FB2, etc.). When your telephone is in Programming Mode, the flexible buttons are numbered as Feature Buttons, as shown in Figures 11-12 and 11-13.

➤ **To place your telephone in Programming Mode A**

➤ Press `3+6+9+Hold` simultaneously. The LCD displays “DKT PROGRAM MODE” and “SELECT=”. Your phone will not ring if it receives a call while in Programming Mode.

➤ **To exit from Programming Mode A**

➤ Go Off- and On-hook or wait for 30 seconds for Programming Mode to automatically time out.

Telephone Program Option Reset

This function resets all Programming Mode A option settings to their default setting.

1. Press `3+6+9+Hold` (simultaneously).
2. Press `Vol ▲ + Msg` (`Msg` LED On means reset is set to activate)
3. Press `Hold` to activate reset.
4. Go off-hook, then on-hook to exit the program mode.

Dial Pad and Button Beeps

Digital telephones can emit a “beep” sound whenever a dial pad or feature button is pressed. The “beeps” are On by default. Follow these steps to turn the “beeps” On or Off on 3000-series DKTs.

1. Press `3+6+9+Hold` (simultaneously).
2. Press `0`.
3. Press Feature Button 1 (FB1) to toggle On/Off.

   FB1, LED On: buttons beep.

   FB1, LED Off: buttons do not beep.
4. Press `Hold` to set the option.
5. You must also go off-hook, then on-hook to exit the program mode.

Speakerphone/Microphone Sensitivity Adjustment

When you are using the speakerphone, high ambient noise levels may cause the party you are talking with to be to cut off frequently. If this happens, follow these steps to lower the sensitivity of the microphone on a 3000-series telephone. The default is normal sensitivity.

1. Press `3+6+9+Hold` (simultaneously).
2. Press `0`.
3. Press Feature Button 3 (FB3) to toggle On/Off.

   FB3, LED On: Lower sensitivity

   FB3, LED Off: Normal sensitivity
4. Press `Hold` to set the option.
5. Go off-hook, then on-hook to exit the program mode.

Call Waiting and Camp-on Ring Tone Over Handset/Headset Option

Call Waiting and Camp-on tones are sent to a busy telephone's speaker to indicate that a call is waiting. Call Waiting and Camp-on Tones can be sent, as an option, to the telephone handset or headset, in addition to the speaker. Follow these steps to turn handset/headset Call Waiting and Camp-on tone On/Off for a 3000-series telephone. The default is Off.

1. Press `3+6+9+Hold` (simultaneously).
2. Press `0`.
3. Press Feature Button 4 (FB4) to toggle On/Off.

   FB4, LED On: Call Waiting tone

   FB4, LED On: No Call Waiting tone
4. Press `Hold` to set the option.
5. Go off-hook, then on-hook to exit the program mode.

Reset and Adjust the LCD Contrast

Step 1: Adjust LCD Contrast for the LCD Telephones

1. Press and hold down the `Mic` button, and press and release `Vol` ▲ or `Vol` ▼ repeatedly.

   Each time you press `Vol` ▲ or `Vol` ▼, the contrast increases or decreases. There are eight steps in either direction. To return to the middle setting, repeat "Step 1" above.
2. Press `Hold` to reset the LCD contrast.
3. Go off-hook, then on-hook to exit the program mode.

Step 2: Reset LCD Contrast for the DKT3014-SDL

1. Press `3+6+9+Hold` (simultaneously).
2. Press `Mode`.
3. Press `Msg` so that the `Msg` LED is On.
4. Press `Hold`. This sets the LCD lightness/darkness contrast on the middle setting.
5. Go off-hook, then on-hook to exit the program mode.

3000-Series Telephones

DKT2000 Mode On/Off

If you have a cordless telephone (DKT2204-CT or DKT2304-CT) that is connected to a 3000-series telephone, you must place your DKT into 2000-mode before connecting the cordless telephone; otherwise, the 3000-series telephone will not work.

In 2000-mode:

- Only 16 characters by two lines display on the LCD.
- LCD Feature button does not work
- Spdial button does not work

Step 1: Turn DKT2000 Mode On/Off

Important! *You must change the mode on DKT3000 telephone before connecting a DKT2204-CT or DKT2304-CT to the DKT3000.*

1. On the DKT3000 telephone, press 3+6+9+Hold (simultaneously).
2. Press #.
3. Press FB7 (or FB13 on the DKT3014). LED On = 2000 telephone. LED Off = 3000 telephone.
4. Press Hold.
5. Lift the handset to exit programming mode. Wait a few seconds for the telephone to reset itself.

Step 2: Connect Cordless Telephone to DKT3000 Telephone

Redial/Feature Button Activation/Deactivation (DKT3001 only)

Your Flex button has been set to act as a Redial button by default. However, you can reprogram the Flex button to work as Flexible Button, as it set in system programming. These steps enable you to change how the button functions.

1. Press 3+6+9+Hold (simultaneously).
2. Press 0 7.
3. Press Msg to toggle On/Off

   Msg LED On: Flex button works as Feature Button

   Msg LED Off: Flex button works as a Redial button.
4. Press Hold to set the option.
5. Go off-hook, then on-hook to exit the program mode.

Note If you program the Flex button to work as Flexible Button 3, you can press * to redial.

Msg/Feature Button Activation/Deactivation (DKT3001 only)

Your Msg button has been set by default to work as a Msg button; however, you can reprogram it to work as Feature Button.

1. Press 3+6+9+Hold (simultaneously).
2. Press 0 8.
3. Press Msg to toggle On/Off.

Msg LED On: Msg operates as Feature Button

Msg LED Off: Works as a Msg button.

4. Press Hold to set the option.
5. Go off-hook, then on-hook to exit the program mode.

Test the Display on Large LCD Telephones (DKT3014-SDL only)

1. Press 3+6+9+Hold (simultaneously).
2. Press Page.
3. Press 1. LCD screen is blank.
4. Press 2. Each segment shows three vertical lines, in all eight rows.
5. Press 3. Each segment contains five short horizontal lines, in all eight rows.
6. Press 4. Each segment contains a pattern of small dots, in all eight rows.
7. Press 5. All of the available characters, including numbers, display.
8. Go off-hook, then on-hook to exit the program mode.

Country Settings On/Off

This procedure enables you to change the country settings for telephone CODEC operation in various countries, see Table 11-7.

1. Press 3+6+9+Hold (simultaneously).
2. Press *.
3. Press Feature Buttons 1~4 (FB1~FB4) On/Off according to the Table below

   ...or, for the DKT3001, pressing 1~4 and toggle the Msg LED On/Off (see following)

   press 1 (Msg LED Off means that FB1 is Off)

   press 2 (Msg LED Off means that FB2 is Off)

   press 3 (Msg LED Off means that FB3 is Off)

   press 4 (Msg LED Off means that FB4 is Off)
4. Press Hold to set the option.
5. Go off-hook, then on-hook to exit the program mode.

Note On the DKT3001, the Msg LED shows if the feature has been turned On/Off. There is no visible indication on the other telephones. If the telephone ringer and busy tone buzzes or doesn't sound clear, check the country settings.

Table 11-7 Country Code Settings for Mu Law/A Law

Country	FB1	FB2	FB3	FB4
USA, Canada (default is Mu Law)	Off	Off	Off	Off
Mexico	Off	Off	Off	On
Taiwan	On	Off	Off	Off
Hong Kong, Thailand	Off	On	Off	Off
Singapore, Malaysia, Indonesia, Sri Lanka, India, China	On	On	Off	On

Digital Add-on Module Installation

The DADM provides 20 buttons that can be flexibly programmed for any telephone feature that is provided by the Strata CTX system. There are two DADM models available—DADM3020 and DADM3120. The differences are shown in Table 11-8.

Table 11-8 DADM Comparison

Add-on Module	DADM3020	DADM3120
Telephone to be connected	DKT3010-S/20-S/10-SD/20-SD, DKT3014-SDL	IPT1020-SD, DKT3010-S/20-S/10-SD/20-SD, DKT3014-SDL
Color of DADM	Black, white	Black
Power Source of ADM Circuit	24 VDC	5 VDC

Install one or two DADM to a Toshiba digital telephone (only) (shown at right) or an IP telephone. The digital telephone and the DADM must belong to the same series, i.e., 3000- or 2000-series. IPT1020-SD telephones can only be connected to a DADM3120.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- See the appropriate system Installation Chapter for loop length and secondary protection requirements.
- DADMs cannot be installed on telephones that have BPCI, BVSU or DVSU installed.

➤ **To install DADMs**

See Figure 11-15 and follow these steps:

1. Loosen the four captive screws on the digital telephone base and remove it.
2. Remove the base handset hanger.
3. Loosen two captive screws on DADM and remove bases.
4. Put the DADM supplied cable through the telephone and DADM bases.
5. Connect DADM cable connectors to P1 of DADM and P1 of DKT telephone.
6. Install base of DADM and telephone – tuck DADM cable into DADM and telephone base, as necessary, for proper length.
7. Secure DADM to telephone base with DADM connecting plate (using four screws).
8. If required to achieve maximum distance, install two-pair house cable (or external power) and two-pair modular cord, supplied with DADM. (See Chapter 10 – MDF PCB Wiring.)
9. If a second DADM should be installed, connect P1 of the second DADM to P2 of the first DADM with the DADM connecting cable.

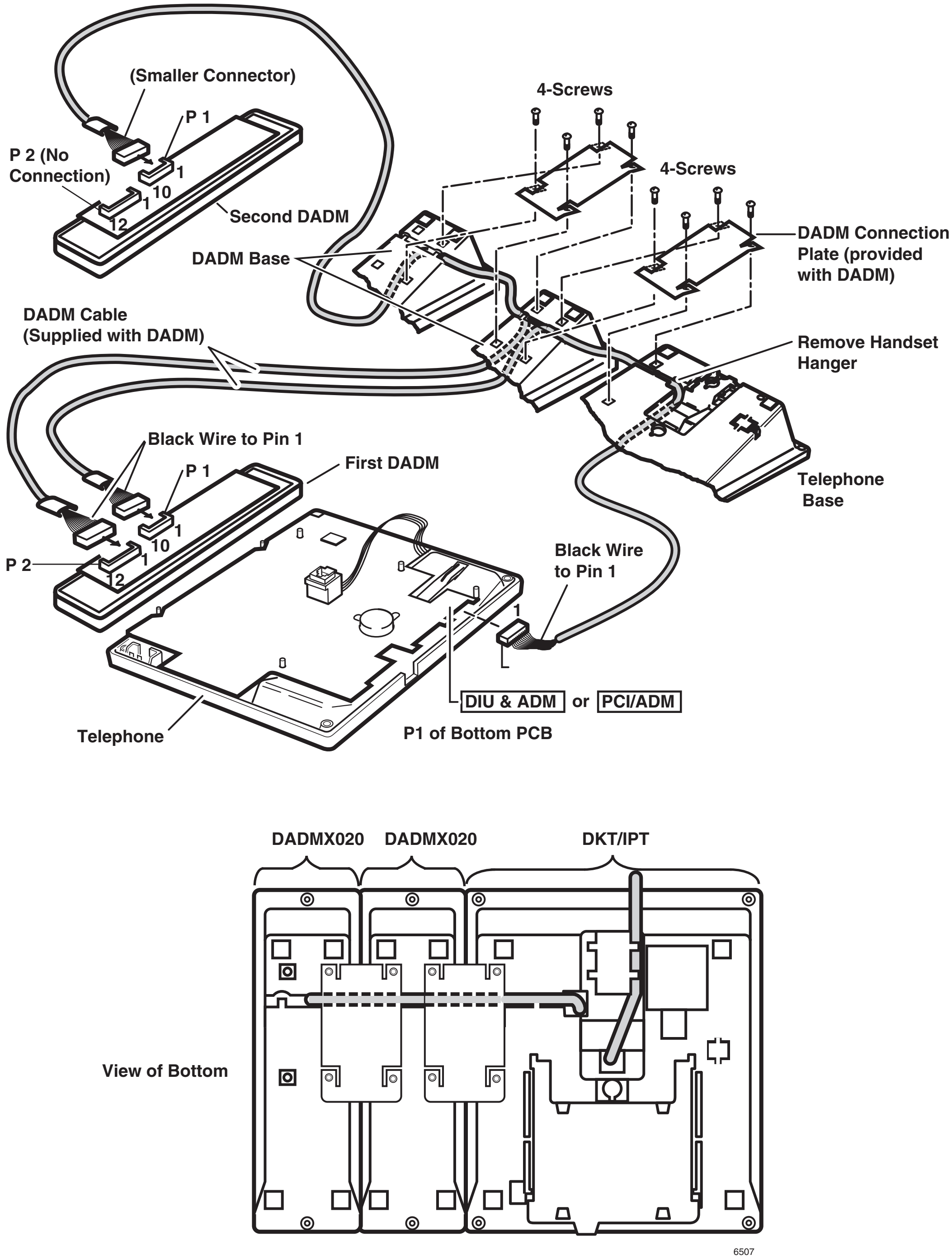

Figure 11-15 Digital Add-On-Module

Tilt Stands

This section explains how to attach desktop tilt stands to 3000-series or 2000-series digital DKTs, the IPT1020-SD or to a DSS console. Use Tilt Stand model "BTSD" (not BTSA) with a standalone DKT, IPT or DSS.

➤ **To attach a Tilt Stand to a 3000-series DKT, IPT1020-SD or DSS**

1. Plug the phone jack into the bottom of the phone or DSS console.
2. Slide the Address Tray out, then gently squeeze the tray and remove it (see Figure 11-16).
3. Pull the top of the Tilt Stand so that it's open at an angle.
4. Slide the Tilt Stand into the former Address Tray holder. (The Stand should catch under the front tray holder notches.) Push Stand in until it snaps into place (see Figures 11-17 and 11-18).
5. Push in the Lock Release to adjust the tilt angle (0, 10, 20 or 30 degrees, see Figure 11-19).
6. Insert the Address Tray back into its holder.

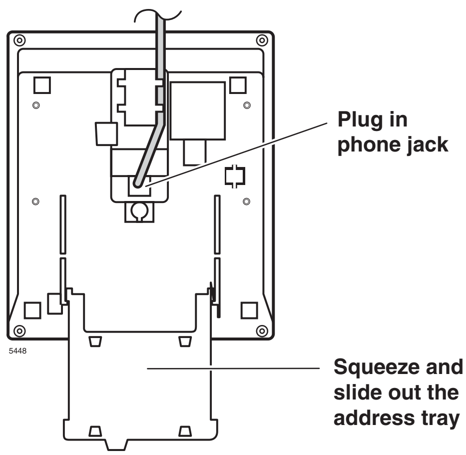

Figure 11-16 Bottom View of Telephone

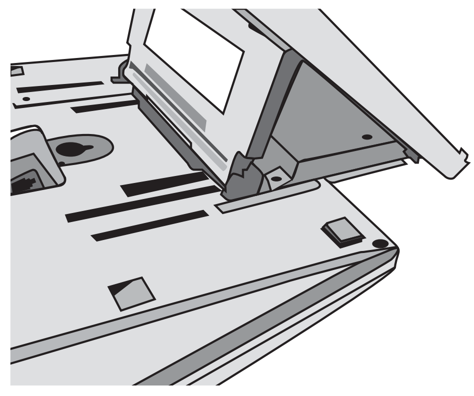

Figure 11-17 Slide Tilt Stand into Address Tray Slot

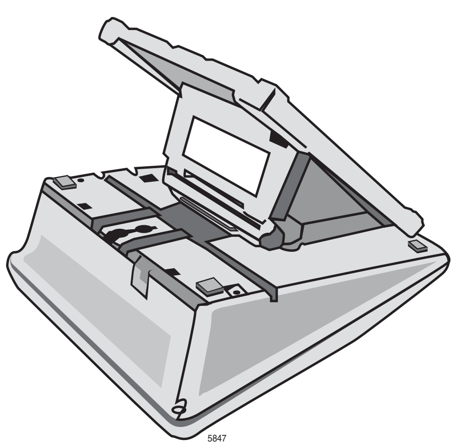

Figure 11-18 Tilt Stand "Snaps" In

Notice:
If you change the tilt stand angle, hold the telephone in your hand when you push the release button so the unit does not fall onto the stand.

Figure 11-19 Telephone on a Tilt Stand

Station Apparatus

Tilt Stand Installation with Add-on Modules

This section explains how to attach a tilt stand to a digital or IP telephone with one or two ADMs. Follow the instructions for the appropriate number of ADMs. Use Tilt Stand model "BTSA" (not "BTSD") for telephones with one or two ADMs.

➤ **To attach a digital or IP telephone with one ADM to a Tilt Stand**

1. Complete the steps under "To install DADMs" on page 11-21.
2. Make sure bottom phone jack is plugged in.
3. Remove Tilt Stand from Tilt Stand Base (see Figure 11-21).
4. Place the spacers on the outer holes, as shown (see Figure 11-22).
5. Attach Tilt Stand to bottom of telephone with screws (see Figure 11-20).
6. Reinstall the Tilt Stand Base: Fit the Tilt Stand Base over the Tilt Stand so that the "bottom pegs" fit into the holder. Adjust Tilt Stand so that the "top pegs" fit into the top Tilt Stand Base holes (see Figure 11-21). Do this to both stands.
7. Pull up on the Tilt Stand Bases so that they open to the maximum angle (30 degrees).
8. Push in the Release button to adjust the tilt angle (0, 10, 20 or 30 degrees) of each Tilt Stand.

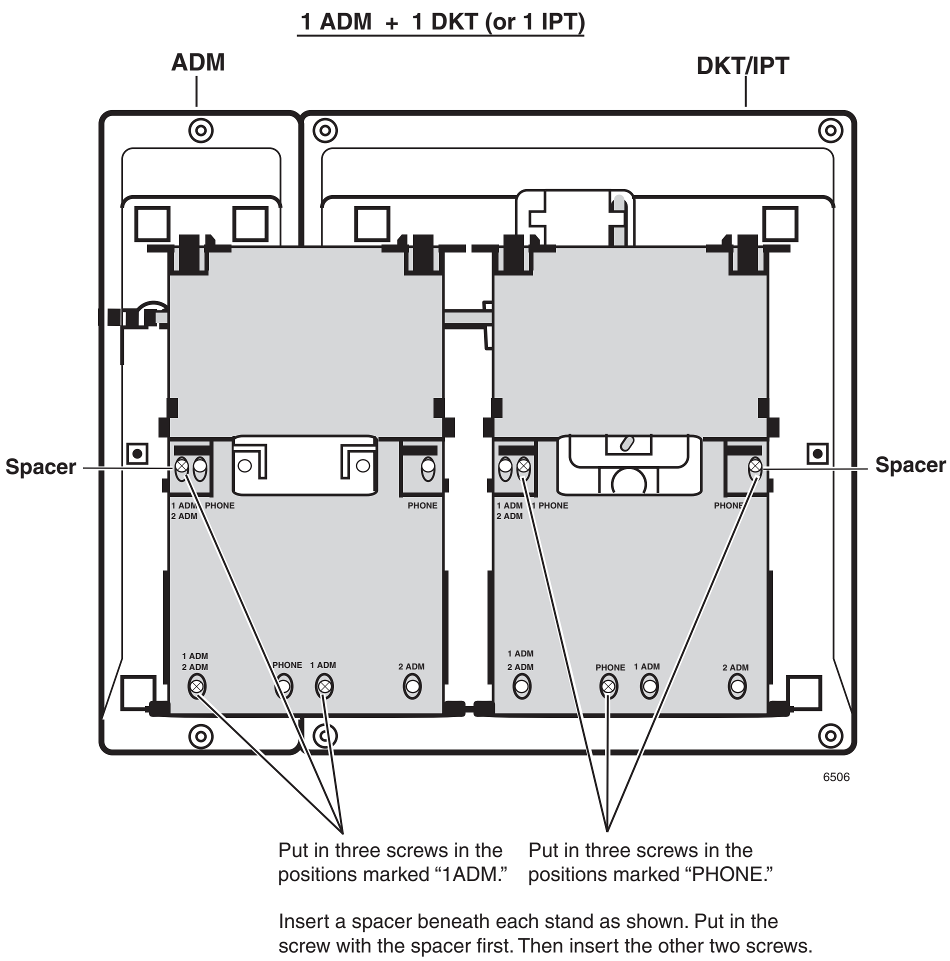

Figure 11-20 Attach Tilt Stands to DKT/IPT and One ADM

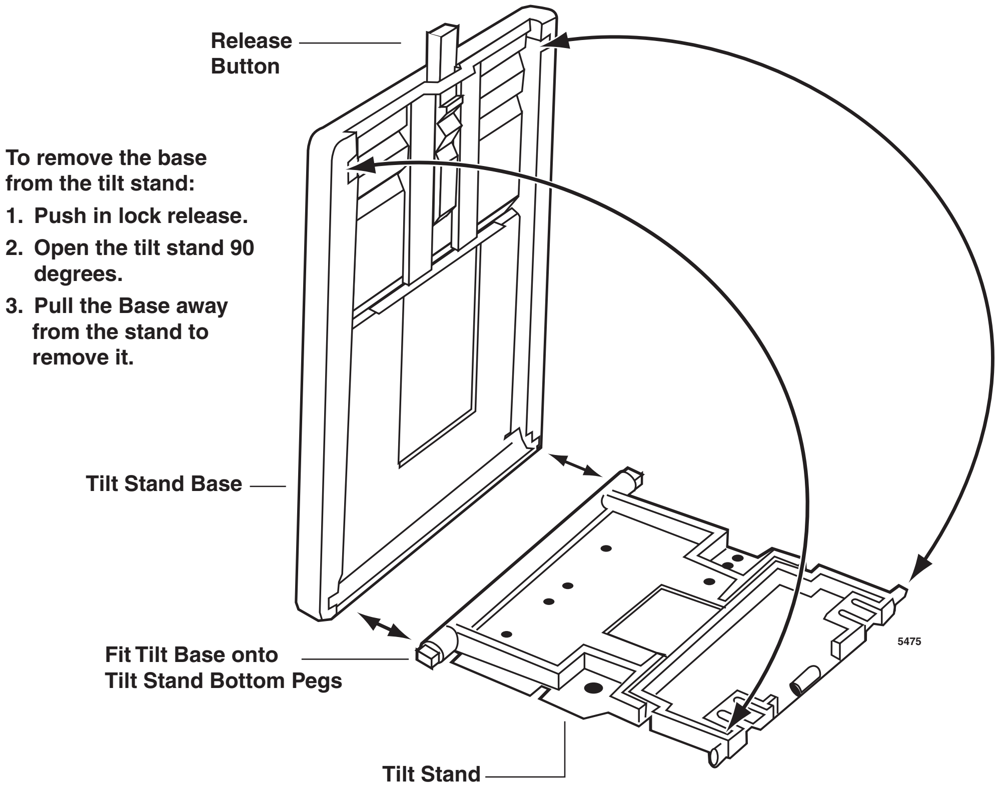

Figure 11-21 Release Adjustment Button

Tilt Stand for DKT/IPT + Two ADMs

Use Tilt Stand models "BTSA" for DKTs or IPTs with one or two ADMs.

➤ To attach a Tilt Stand to a 3000-series DKT, IPT1020-SD with two ADMs

1. Complete the steps under "To install DADMs" on page 11-21.
2. Make sure bottom phone jack is plugged in.
3. Remove Tilt Stand from Tilt Stand Base (see Figure 11-21).
4. Place the spacers on the outer holes, as shown (see Figure 11-22).
5. Attach Tilt Stand to bottom of DKT with screws.
6. Reinstall the Tilt Stand Base: Fit the Tilt Stand Base over the Tilt Stand so that the "bottom pegs" fit into the holder. Adjust Tilt Stand so that the "top pegs" fit into the top Tilt Stand Base holes. Do this to both stands.
7. Pull up on the Tilt Stand Bases so that they open to the maximum angle (30 degrees). See Figure 11-23.
8. Push in the Lock Release button to adjust the tilt angle (0, 10, 20 or 30 degrees) of each Tilt Stand.

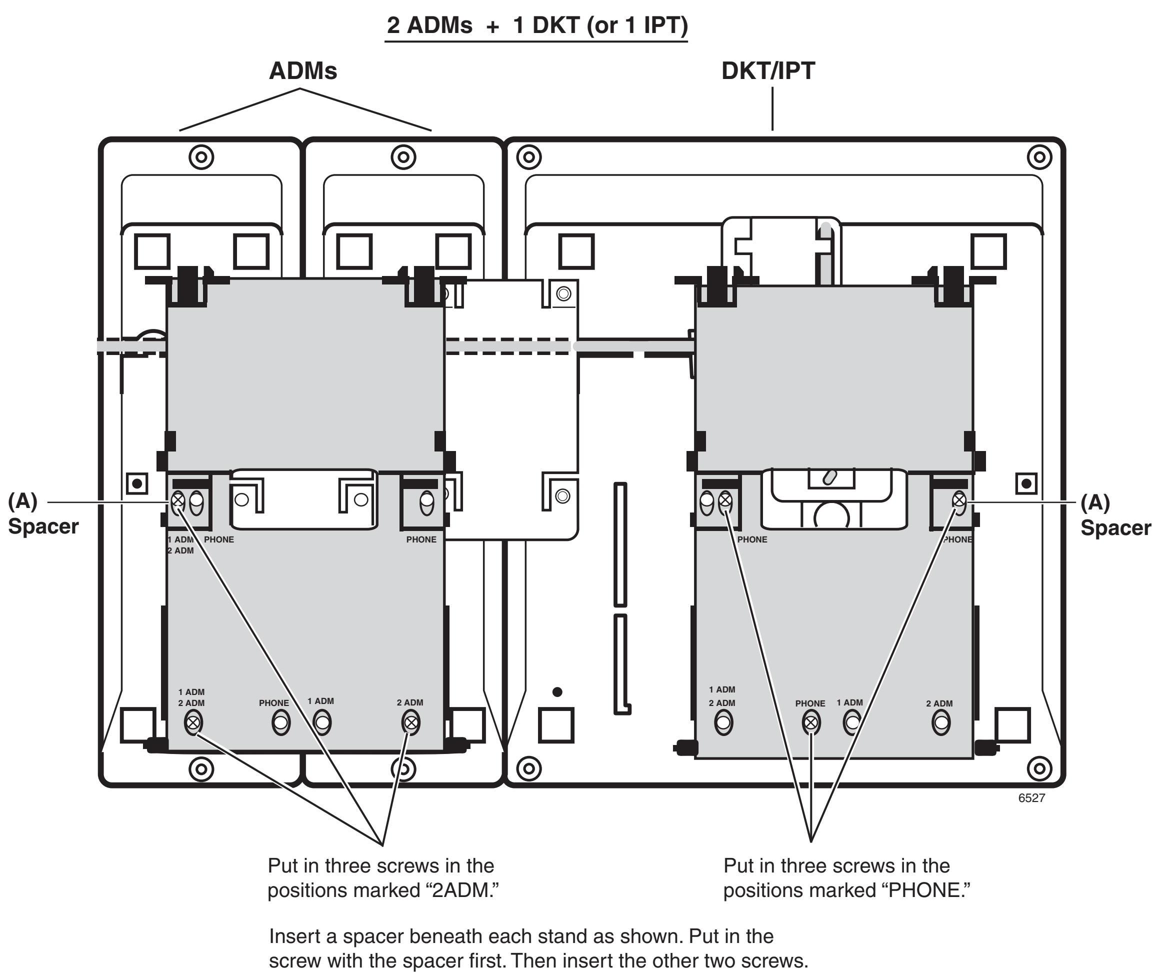

Figure 11-22 Attach Tilt Stands to DKT/IPT with Two ADMs

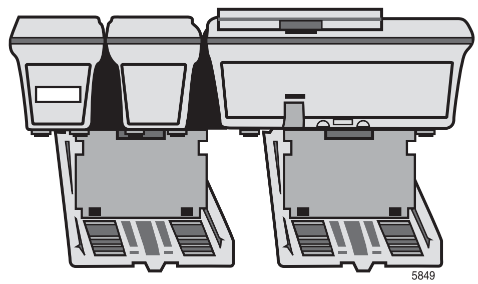

Figure 11-23 Tilt Stands in Raised Position for DKT and Two ADMs

Telephone Wall Mounting

This section explains how to mount digital telephones to a wall. See the manufacturer's documentation for instructions on mounting standard phones.

Notes

- Digital telephones equipped with BPCIs or PDIU-DI2s cannot be wall mounted.
- DKT3014-SDL equipped with a BHEU cannot be wall-mounted.
- 2000-series digital telephones with headsets can only be wall mounted with an HHEU2.

➤ **To mount digital telephones**

Refer to Figures 11-24~11-26 and the following steps.

1. Loosen the captive screws, and remove the telephone base.
2. Using a suitable cutter, remove the handset hanger from the base.
3. Insert the handset hanger in the slot on the front of the phone. The hanger fits in the notch on the handset cradle.
4. Rotate the telephone base 180 degrees and secure it to the telephone with its four captive screws.

Note Tilt up the LCD of the DKT3014-SDL before fixing the base.

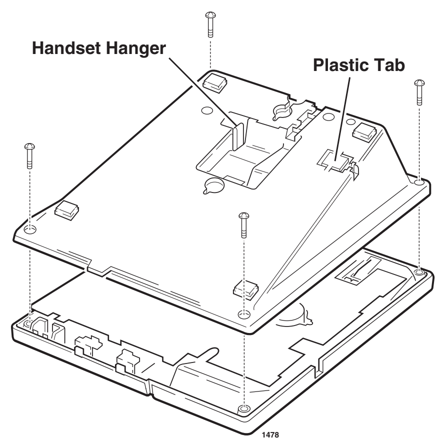

Figure 11-24 Removing the Telephone Base

Station Apparatus

5. Connect the phone to the wall modular connector with a cord approximately four inches long (available at most telephone supply companies).
6. Route the cord into the hollow portion of the base.

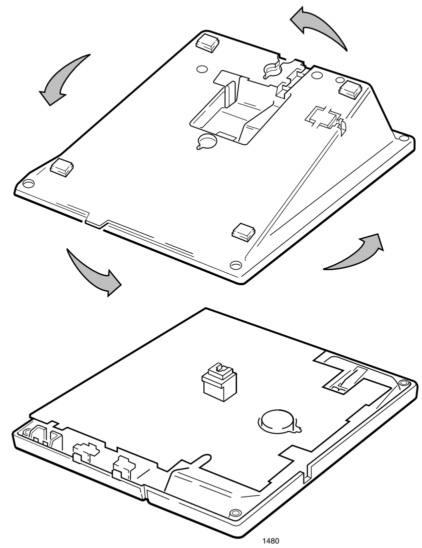

Figure 11-25 Wall Mounting Base Rotation

7. Mount the phone on the wall mounting modular connector plate.

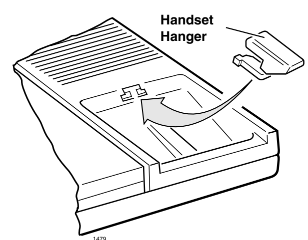

Figure 11-26 Handset Hanger

➤ To wall mount DKT3001 or DKT2001 digital SLTs

1. Loosen the screws, and remove the telephone base.
2. Using a suitable cutter, remove the handset hanger from the base.
3. Insert the handset hanger in the slot on the front of the phone. The hanger fits in the notch on the handset cradle.
4. Rotate the telephone base 180 degrees and secure it to the telephone with its four screws.
5. Connect the phone to the wall modular connector with a cord approximately four inches long (available at most telephone supply companies).
6. Route the cord into the hollow portion of the base.

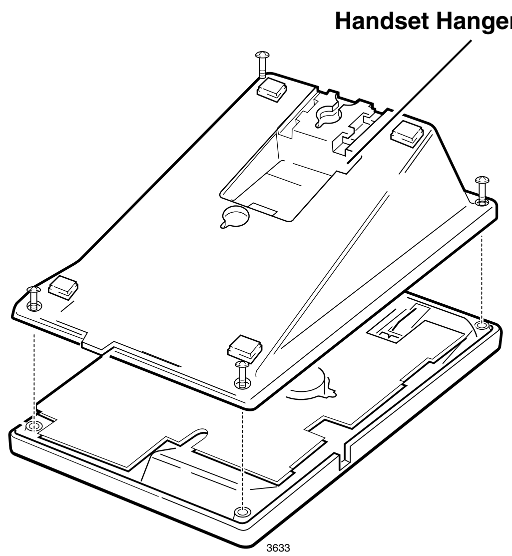

Figure 11-27 Removing the Telephone Base

7. Mount the phone on the wall mounting modular connector plate. For instructions for installing and programming the DKT2001, see "Digital Single Line Telephone (DKT2001 only)" on page 11-57.

Direct Station Selection (DSS) Console/System Connection

The DSS console can be connected to a BDKU/BKDS or PDKU on any circuit. DSS consoles are associated with digital telephones via system programming. This section provides instructions on how to install the consoles.

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DSS Console Connections

DSS consoles are connected to BDKU/BDKS or PDKU PCBs using standard twisted single-pair or two-pair jacketed telephone cable (maximum 1000 feet, 303 meters) is used for the connection.

To accommodate the DSS console connection, the instrument end of the cable should be terminated in a modular station connector block (RJ11). Refer to Chapter 10 – MDF PCB Wiring for wiring/interconnecting details.

Notes

- DSS console cable runs must not have cable splits (single or double), cable bridges (of any length) or high resistance or faulty cable splices.
- See the appropriate Installation chapter for secondary protection information and loop limits.

CAUTION! **When installing the DDSS cable, do not run the cables parallel if they are within three feet of an AC power line. AC power lines should be crossed at right (90◦) angles only. In particular, avoid running station wire pairs near devices that generate electrical noise, such as neon or fluorescent light fixtures.**

Standard Telephones

This section explains how to connect standard telephones to the Strata CTX670 system. Toshiba does not provide standard telephones. Whenever standard telephones are mentioned in this manual, it refers to 500- and 2500-type standard telephones.

Note Before proceeding, see warning and caution notes in “3000-series Telephone Installation” on page 11-2.

Standard telephones connect to circuits on the Standard Telephone Interface PCBs: RSTU, RSTU2, RDSU/RSTS and PSTU via the MDF with standard twisted-pair jacketed telephone cable. (See single-pair wiring in Chapter 10 – MDF PCB Wiring for more details.)

The standard telephone cable’s overall loop resistance, connected on- or off-premises, is 300 ohms max. for PSTU; 600 ohms for RSTU and RDSU/RSTS with -24VDC (*no* R48S), and 1200 ohms for RSTU and RDSU/RSTS with -48VDC (R48S installed on RSTU, RSTU2, or RDSU PCB), including telephone resistance. This applies to all devices connected to standard telephone circuits.

A standard telephone connected off-premises via the telephone network should interface with OL13A, OL13B, or OL13C lines (or equivalent) and connect to an RJ21X, FIC jack or equivalent.

Cordless Digital Telephones

Toshiba offers two cordless digital telephone models, the DKT2204-CT and the DKT2304-CT (shown right). The DKT2204-CT uses digital spread spectrum and the DKT2304-CT uses digital narrow band technology.

Some of the features for both cordless models include:

- Liquid Crystal Display (LCD) that wraps using two lines, total of 32 characters
- Ringer and handset volume control
- Single button access to: Conference, Hold, Redial, Message and Transfer features
- Four programmable function buttons
- Charging stand
- AutoStandby
- AutoTalk
- Vibrate ringer alert
- Out-of-range protection
- Low-battery protection system
- Headset jack (2.5mm)
- Stand-alone or DKT operation
- High quality ultra-secure conversation with 32Kbps Adaptive Differential Pulse Code Modulation (ADPCM) voice code combination.
- Three ring tones

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Figure 11-28 DKT2204-CT

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Figure 11-29 DKT2304-CT

Cordless Telephone Compatibility

The chart below shows the compatibility of Strata DKT2204-CT and the DKT2304-CT with Strata CTX digital line cards. The BDKU PCB has a switch for BDKU or PDKU mode. A “standalone” cordless phone connects directly to a digital line circuit without an associated DKT.

PCB System Type	BDKS D2 Jumper Plug	DKT-2204/ (Stand alone)	DKT-2204 w/ DKT		DKT-2304 (Stand alone)	DKT-2304 w/ DKT	
			Cordless	DKT		Cordless	DKT
PDKU in Strata CTX or DK	Not Applicable	OK	OK	OK	OK	OK	OK
BDKU in Strata DK	PDKU position	OK	OK	OK	OK	OK	OK
BDKU/BDKS in Strata CTX	BDKU position	OK	OK	See Notes	OK	OK	See Notes

Notes

- The handset and base unit of each cordless telephone is equipped with the same security code. In order for the handset to operate, it must be installed with the matching base unit.
- DKT3000 telephones must be set to operate in the DKT2000 mode when used with the DKT2204-CT and the DKT2304-CT (see “DKT2000 Mode On/Off” on page 11-19).

Cordless Telephone Installation

Step 1: Review Safety Instructions

WARNING! **Toshiba DOES NOT represent this unit to be waterproof. To reduce the risk of fire, electrical shock, or damage to the unit, DO NOT expose this unit to rain or moisture.**

➤ Read and understand all product instructions.

➤ Follow all warnings and instructions marked on the product.

➤ Cleaning precautions:
- Unplug this product from the wall outlet before cleaning.
- Do not use liquid cleaners or aerosol cleaners.
- Use a dry cloth for cleaning.

➤ Do not use this product near water; for example, near a sink, or in any wet area.

➤ Never spill liquid of any kind on the product.

➤ Do not place this product on an unstable cart, stand, or table. The telephone could fall, causing serious damage to the unit.

➤ To protect the product from overheating, do not:
- Block or cover any slots or openings in the base unit.
- Place near or over a radiator or heat register.
- Place in an enclosed cabinet unless proper ventilation is provided.

➤ Operate this product only from the type of power source indicated on the marking label.

➤ Do not allow anything to rest on the power cord. Do not locate this product where the cord could be damaged by persons walking on it.

➤ Do not overload wall outlets and extension cords because it could result in fire or electrical shock.

➤ Never push objects of any kind into the base unit slots, as the objects could touch dangerous voltage points or short out parts that could cause fire or electric shock.

➤ To reduce the risk of electric shock, do not disassemble this product. Opening or removing covers could expose you to dangerous voltages or other risks. Incorrect re-assembly can cause electric shock when the appliance is subsequently used. Contact qualified service personnel when service or repair work is required.

➤ Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
- When the power supply cord is damaged or frayed.
- If liquid has been spilled into the product.
- If the product has been exposed to rain or water.
- If the product does not operate normally when following the operating instructions. Adjust only those controls that are covered by the operating instructions. Improper adjustment of other controls may result in damage, and will often require extensive work by a qualified technician to restore the product to normal operation.

- If the product has been dropped, or the cabinet has been damaged.
- If the product exhibits a distinct change in performance.

➤ Do not use the telephone to report a gas leak in the vicinity of the leak.

WARNING! Do not attempt to unplug any appliance during an electrical storm.

➤ Unplug all electrical appliances when you know an electrical storm is approaching. Lightning can pass through the wiring and damage any device connected to it. This telephone is no exception.

CAUTION! Changes or modifications to this product not expressly approved by Toshiba, or operation of this product in any way other than as detailed by this User Guide, could void your authority to operate this product.

WARNING! To reduce the risk of fire and/or personal injury from the Nickel-Cadmium battery, follow these instructions:

- ➤ **Use only battery model BT-2499 (DKT2204-CT) or BT930 (DKT2304-CT). Use of any other battery could cause a safety hazard.**
- ➤ **Do not dispose of the battery in a fire. The cell will explode. Under federal, state and local laws, it could be illegal to dispose of old batteries by placing them in the trash. Check with your local government for information on where to recycle or dispose of old batteries. If you cannot find the information you need, contact Toshiba for assistance.**
- ➤ **Do not remove or damage the battery casing.**
- ➤ **Do not short circuit the battery. Exercise care in handling the battery in order not to short the battery with rings, bracelets, and keys or other conductive materials. The battery or conductor could overheat and cause burns.**
- ➤ **Charge the battery only in accordance with the instructions and limitations specified in the instruction manual provided for this product.**
- ➤ **Do not charge the Rechargeable battery in any charger other than the one designed to charge it as specified in this user guide. Using another charger may damage the battery, or cause the battery to explode.**
- ➤ **Observe proper polarity orientation between the battery and charging unit.**

Step 2: Select Location

1. Select a location that is not subject to excessive heat or humidity. Keep the base unit and handset away from sources of electrical noise, such as motors and fluorescent lighting.
2. Determine if the base unit will sit on your desk or be wall mounted. If wall mounted, go to Step 6: "Wall Installation (Optional)" on page 36.
3. Place the base unit on a desk or tabletop near a standard 120VAC outlet and within reach of the Strata CTX digital line connection.

Important! *Place the base unit to the right of the DKT. If placed on the left, the cordless antenna picks up a tone due to its close proximity to the DKT speaker and electronic parts.*

Step 3: Place DKT3000-series Telephones into 2000-Mode

You must place your DKT3000-series telephone into 2000-mode before connecting the cordless telephone; otherwise, the 3000-series telephone will not work.

In 2000-mode, the DKT3000 telephone operation changes are:

- Only 16 characters by two lines display on the LCD.
- LCD Feature button does not work
- `Spdial` button does not work

➤ **To change DKT3000-series telephones into 2000-mode**

1. On the DKT3000 telephone, press `3+6+9+Hold` (simultaneously).
2. Press `#`.
3. Press `FB7` (or `FB10` on the DKT3014). LED On = 2000 mode. LED Off = 3000 mode.

Note Flexible Buttons (FB) are numbered from the bottom up and left to right.
`FB7` for example would be the seventh button up on the left.

4. Press `Hold`.
5. Lift the handset to exit programming mode. Wait a few seconds for the telephone to reset itself.

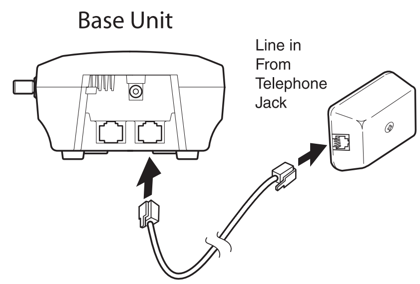
Step 4: Connect Telephone Cables

Your cordless telephone must be connected to a digital telephone PBX port.

WARNING!
- **Never install telephone wiring during a lightning storm.**
- **Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.**
- **Use caution when installing or modifying telephone lines.**

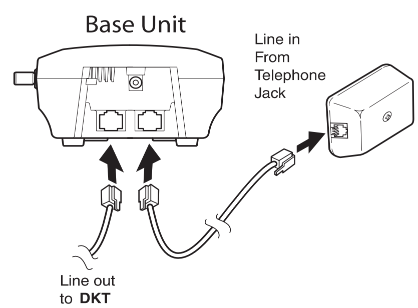
➤ **To connect as a stand-alone telephone**

- Connect the modular jack labeled "Line In" directly to the telephone wall jack using one of the supplied cables (shown at right).



➤ **To connect to a Strata DKT**

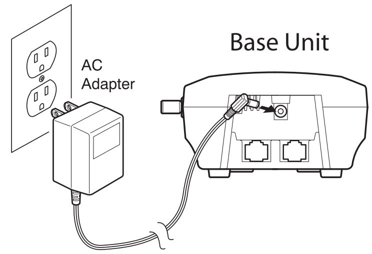
1. Unplug the cable from the DKT and plug into the "Line In" jack of cordless telephone base unit (shown at right).
2. Plug the additional two-foot cable into the "Line Out" jack of the base unit and into the DKT jack located on the bottom of the telephone.



Step 5: Connect and Apply Power

Base Unit

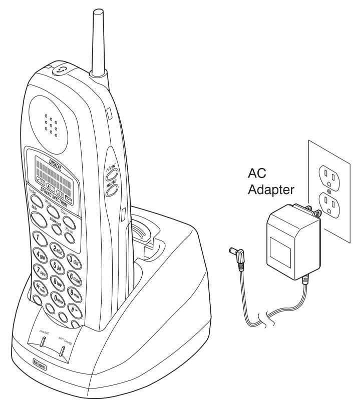
1. Plug the AC adapter cord into the AC adapter input jack on the base unit (shown at right).
2. Plug the AC adapter into a standard 120VAC wall outlet.
3. Check to see that the power LED is on.



Charging Unit

1. Plug the AC adapter cord into the input jack on the charging unit (shown at right).
2. Plug the AC adapter into a standard 120VAC wall outlet.
3. Check to see that the CHARGE LED is on.

Note You can place the handset in the charging unit with or without the belt clip attached.



DKT2204-CT (pictured)

Important!

- *Use only the supplied AC adapter.*
- *If the CHARGE LED on the charging unit and/or the POWER LED on the base unit do not light, return everything to your Authorized Dealer.*
- *Always route the power cord where it is not a trip hazard, and where it cannot become chafed and create a fire or electrical hazard.*

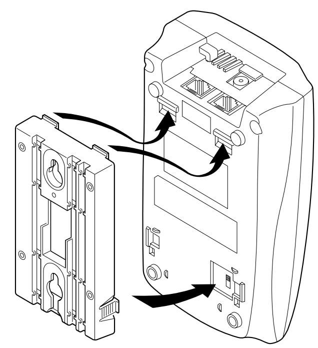
Step 6: Wall Installation (Optional)

Important! *You must place your DKT3000-series telephone into 2000-mode before connecting the cordless telephone; otherwise, the 3000-series telephone will not work. See “Place DKT3000-series Telephones into 2000-Mode” on page 33 for instructions.*

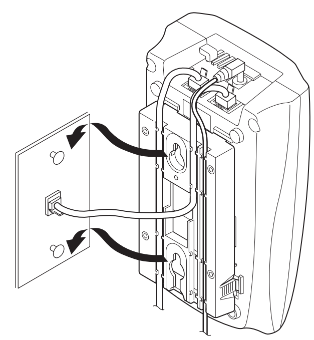
Standard Wall Plate Mounting

These telephones are designed to be mounted on a standard wall plate. To attach the wall mount stand to the base unit:

1. Select a wall location near a 120VAC outlet and within reach of the Strata CTX digital line connection.
2. Slide the wall mount stand into the notches at the top of the base unit, push the wall mount stand down and snap it into place (shown right).



3. Plug the AC adapter into the base unit.
4. Place the AC adapter cord inside the molded channel of the wall mount stand.
5. Plug one end of the telephone cord into the LINE jack on the base unit. Optionally, plug one end of a Strata DKT telephone into the PHONE jack. Then place the telephone cord(s) inside the molded channel(s) on the bottom of the wall mount stand.
6. Plug the other end of the telephone cord into the modular wall jack.
7. Place the base unit on the posts of the wall plate and push down until it’s firmly seated (shown right).



8. Plug the AC adapter into a standard 120VAC wall outlet.

Note Do not use an outlet controlled by a wall switch.

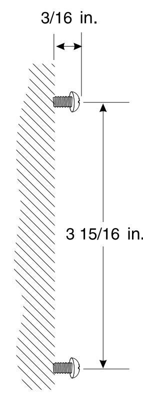
Direct Wall Mounting

If you do not have a standard wall plate, you can mount your telephone directly on a wall. Before mounting your telephone, consider the following:

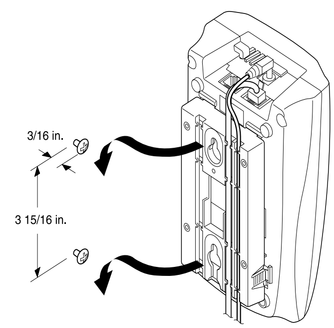
- Select a location away from electrical cables, pipes, or other items behind the mounting location that could cause a hazard when inserting screws into the wall.
- Make sure the wall material is capable of supporting the weight of the base unit.
- Use #10 screws with anchoring devices suitable for the wall.

➤ To wall mount the base unit

1. Insert two mounting screws 3-15/16 inches apart. Allow about 3/16 of an inch between the wall and screw heads for mounting the telephone (shown right).
2. Plug and secure the AC adapter cord by following Steps 2 and 3 of the “Standard Wall Plate Mounting” on page 36.
3. Plug one end of the telephone line cord into the LINE jack on the base unit. Optionally, plug one end of a Strata DKT telephone into the PHONE jack. Then place the telephone cord(s) inside the molded channel(s) on the bottom of the wall mount stand.



4. Place the base unit on the posts of the wall screws and push down until it’s firmly seated.
5. Plug the other end of the telephone cord into a telephone wall jack.
6. Plug the AC adapter into a standard 120VAC wall outlet by following Step 7 of the Standard Wall Plate Mounting.



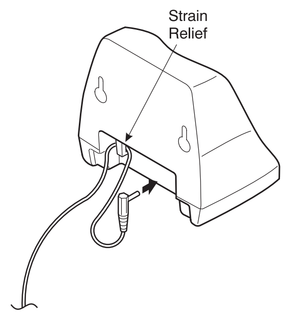
Charging Unit Wall Mounting

The charging unit is also designed to be wall mounted. Before mounting your charging unit, consider the following:

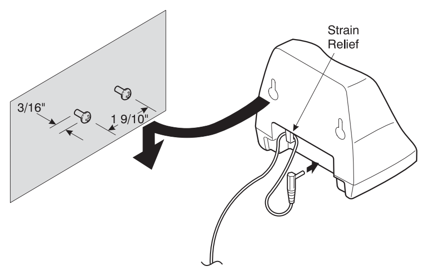
- Select a location away from electrical cables, pipes, or other items behind the mounting location that could cause a hazard when inserting screws into the wall.
- Make sure the wall material is capable of supporting the weight of the charging unit.
- Use #10 screws with anchoring devices suitable for the wall material where the charging unit will be placed.

DKT2204-CT

1. Insert two mounting screws 1-9/10 inches apart. Allow about 3/16 of an inch between the wall and screw heads for mounting the telephone.
2. Plug the AC adapter into the charging unit as previously described. Wrap the AC adapter cord around the strain relief (shown right).

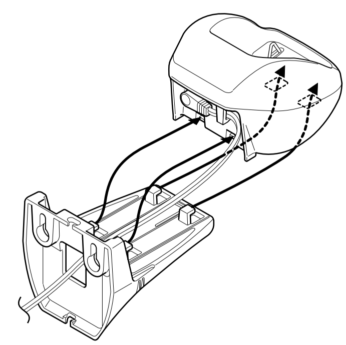


3. Place the charging unit on the posts of the wall screws and push down until it's firmly seated (shown right).
4. Plug the AC adapter into a standard 120VAC wall outlet.

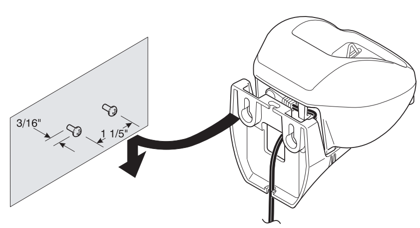


DKT2304-CT

1. Insert two mounting screws 1-1/5 inches apart. Allow about 3/16 of an inch between the wall and screw heads for mounting the telephone (shown right).
2. Pass the one end through the hole of the wall mount stand and plug it into the charging unit. Wrap the AC adapter cord around the strain relief.
3. Slide the wall mount stand into the notches on the bottom of the charging unit.



4. Place the charging unit on the posts of the wall screws and push down until it's firmly seated (shown right).
5. Plug the AC adapter into a standard 120VAC wall outlet.



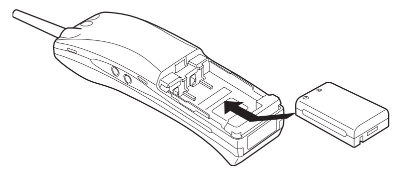
Step 7: Raise the Base Unit Antenna

➤ Before using your handset, raise the base unit antenna to the vertical position.

Step 8: Install Handset Battery Pack

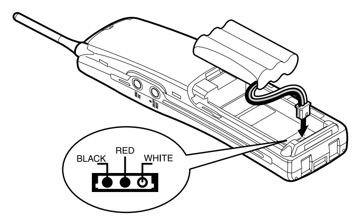
DKT2204-CT

1. Remove the battery cover by pressing the latch and sliding the cover down and off the handset.
2. Slide the battery pack down into the handset (shown right).
3. Securely close the battery compartment cover by sliding it up until it snaps into place.



DKT2304-CT

1. Remove the battery cover by pressing the latch and sliding the cover down and off the handset.
2. Connect the battery pack connector observing correct polarity to the jack inside the battery compartment. Do not exert any force on this connection. It could cause damage to the battery or handset. Once you are certain that you have made a good connection, then insert the battery pack into the battery compartment. Do not pinch the wires (shown right).
3. Securely close the battery compartment cover by sliding it up until it snaps into place.

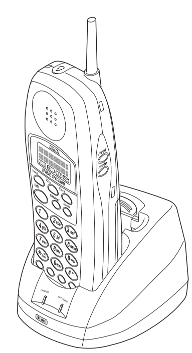


CAUTION! **Rechargeable Nickel-Metal-Hydride batteries must be disposed of properly.**

Step 9: Charge Batteries for First Time

Important! *Before using your handset, the battery must be continuously charged for five hours.*

1. Place the handset in the charging unit (shown at right).
2. Ensure that the CHARGE LED lights. If it does not, make sure that the AC adapter is plugged in and that the handset is making good contact with the charging unit contacts.



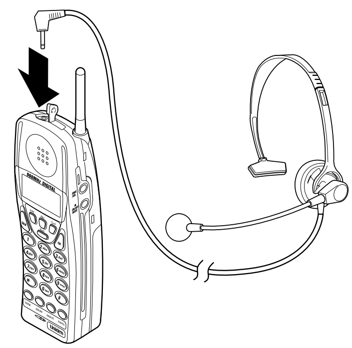
DKT2204-CT Charging Unit (pictured)

Step 10: Install Headset (Optional)

The optional headset provides a hands-free option. With the headset installed, you can use the belt clip to carry the handset and conduct a conversation. All feature operations remain the same except the handset earphone and microphone are disconnected.

➤ Open the cover over the headset jack that is located on the top of the handset and plug in the headset as shown at right.

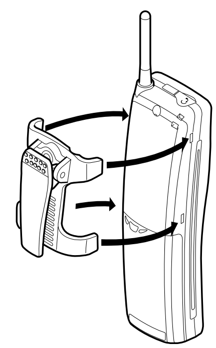
Important! *Only use headsets especially designed or modified for use with radio frequency equipment.*



Step 11: Attach Belt Clip (Optional)

Note The belt clip is designed to fit snugly onto the handset.

1. Snap the tab out of the belt clip notch on the top of the handset.
2. Slide the belt clip into the space where the belt clip tab was, carefully aligning the belt clip sides to the notches.
3. Press firmly until it snaps into place.
4. Use the belt clip to attach the handset to your belt or pocket.



➤ **To remove the belt clip**

1. Press the retaining clip in toward the belt clip blade and slide the clip up at the same time.

Reinstall the cover tab.

Cordless Telephone Troubleshooting and Specifications

This section covers these topics:

- Troubleshooting
- Simultaneous conversation channels
- Range and performance
- Radio interference
- Telephone line problems
- More than one cordless telephone
- Privacy
- Specifications

Troubleshooting

If your cordless telephone is not performing to your expectations, try the suggestions in Table 1. If you are still unable to resolve the problem, contact your telephone System Administrator.

Important! *Do not attempt to service this unit yourself. All service must be done by qualified service personnel.*

Table 1 Troubleshooting Suggestions

Condition	Suggestion
CHARGE LED does not light when handset is placed on charging unit.	• Make sure the AC adapter is plugged into the charging unit and wall outlet. • Make sure handset is properly seated in charging unit. • Make sure the battery pack is properly placed in the handset. • Make sure that the charging contacts on the handset and charging unit are clean.
Conversation is interrupted frequently.	• Make sure that the base unit antenna is fully vertical. • Move closer to the base unit. • Check for low battery warning.
Warning tone and NO SERVICE message.	• Move closer to the base unit. • Make sure the AC adapter is plugged into the base unit and wall outlet.
Handset doesn't ring.	• The battery pack may be weak. Charge the battery pack for five~six hours. • Make sure the base unit antenna is fully vertical. • The handset may be too far away from the base unit. • The ringer may be set to Off. • Make sure the AC adapter is plugged into the base unit and wall outlet.

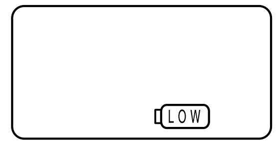
Low Battery

Your cordless telephone comes equipped with one rechargeable battery:

- DKT2204-CT: BT2499 battery that provides six hours of talk and four days of standby time (fully charged).
- DKT2304-CT: BT930 battery that provides seven hours of talk and five days of standby time (fully charged).

A "fast charge" in the handset and a "trickle charge" in the charging unit enables the extended talk and standby times.

When the battery is low, the Battery icon displays on the LCD (shown right) and the handset beeps. Low battery symptoms are:



- On a call
    - All buttons and functions operate
    - Handset beeps once every three seconds

Note To continue your call, you must replace the battery pack within 20 seconds.

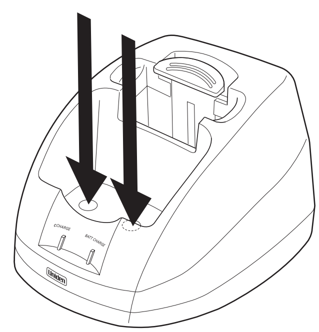
- In standby mode
    - None of the buttons operate
    - LCD messages are cleared
    - Handset beeps every 15 seconds for three minutes
    - Cannot make or receive call

To restore your battery capacity, return the handset to the charging unit for charging or replace the handset battery with a charged one. If the handset is on the charging unit for one minute, battery low condition is cancelled. The Battery icon is turned Off and battery low tone stops.

For more information on installing and charging the battery, see Step 8: "Install Handset Battery Pack" on page 39.

Cleaning Charging Unit Contacts

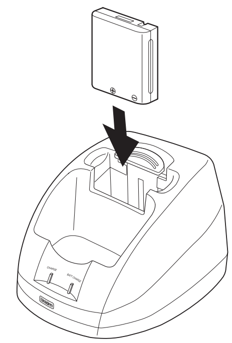
To maintain a good charge, it is important to clean all charging contacts on the handset, spare battery pack (DKT2204-CT only) and charging unit about once a month (shown right). Use a pencil eraser or a soft dry cloth. Do not use any liquids or solvents.



DKT2204-CT Charging Unit (pictured)

Charging Spare Battery Packs (DKT2204-CT only)

The charging unit of your cordless telephone is equipped to charge the spare battery pack with or without the handset in the front slot.



1. Slide the spare battery pack into the second slot in the charging unit until the retaining clip snaps over the top of the pack.
2. Make sure the BATT CHARGE indicator lights. If the BATT CHARGE indicator doesn't light, check to see that the AC adapter is plugged in, and that the battery pack is making good contact with the unit's charging contacts.

Note Charge the battery pack without interruption for 12~15 hours.

3. When charging is complete, press out on the latch and remove the battery pack for use. Or, if you don't need the battery pack immediately, leave it in the charging compartment. It will not overcharge.

Simultaneous Conversation Channels

DKT2204-CT

The DKT2204-CT cordless digital telephone has 10 operating channels available.

A common misconception is that this limits a customer to 10 cordless telephones. This is not the case. Each cordless digital telephone can operate on any of the 10 channels. When you turn on a cordless digital telephone, the telephone selects an available channel within its' range. In a given cordless range, 10 simultaneous calls can be made. In most businesses, it is unlikely that all 10 channels will be in use at the same time. Typically 20 to 30 telephones can share the 10 channels.

Another factor is the distribution of the telephones in a facility. If your cordless digital telephones are disbursed throughout a facility, there should not be contention for channels. If there are more than 10 cordless digital telephones in one area and 10 users are using their cordless telephones, an 11th user would not be able to connect at that time.

DKT2304-CT

The DKT2304-CT cordless handset has 30 operating channels available. A common misconception is that this limits a customer to 30 handsets. This is not the case. Each handset can operate on any of the 30 channels because each one selects an available channel within its range. In a given range, 30 simultaneous calls can be made.

Another factor is the distribution of the telephones in a facility. If your handsets are disbursed throughout a facility, there should not be contention for all channels. If there are more than 30 in one area and 30 users are using their handsets, the 31st user would not be able to get dial tone.

Range and Performance

The DKT2204-CT operates up to 1.1 miles and the DKT2304-CT .7 miles from its base in a completely unrestricted test environment. Typically, ranges of 300 to 400 feet are possible, depending on the building structure in which it is used. For optimum range and performance from your handset, try the following:

- Place the base units at least three to six feet away from the DKT; three feet from metal structures; and six feet from computers, fax machines or other electronic equipment.
- Use an AC outlet not associated with computer or electromagnetic equipment.
- Wherever possible, put the base unit in the middle of the coverage area.
- Mount the base unit high in the room for maximum range.
- If you have two to three cordless telephones, put them 12 feet apart.
- If you have four to 10 cordless telephones, put them 20 feet apart.
- If you want to use more than one cordless telephone in your office, they must operate on different channels. Press the Channel (DKT2204-CT)/CH (DKT2304-CT) button on the handset to select a channel that provides the clearest communication.

Radio Interference

Radio interference occasionally interrupts conversations, which does not mean that your unit is defective. Move to a different location while you are talking. If the interference continues, move the base unit. If there is still interference, contact your System Administrator.

Telephone Line Problems

The FCC and IC have granted the telephone company the right to disconnect service in the event that your telephone causes problems on the telephone line. Also, the telephone company may make changes in facilities and services which may affect the operation of your unit. However, your telephone company must give adequate notice in writing prior to such actions to allow you time for making necessary arrangements to continue uninterrupted service.

If you are having trouble with your telephone service, you must first disconnect your telephone to determine if it is the cause of your problem. If you determine that it is the cause, you must leave it disconnected until the trouble has been corrected.

Privacy

Cordless telephones are radio devices. Communications between the handset and base unit of your cordless telephone are accomplished by means of radio waves which are broadcast over the open airways. Because of the inherent physical properties of radio waves, your communications can be received by radio receiving devices other than your own cordless telephone unit. Consequently, any communications using your cordless telephone may not be private.

Specifications

For frequencies, power requirements, weight and size specifications, see Table 2.

Table 2 Specifications

Feature	DKT2204-CT	DKT2304-CT
General		
Frequency Control	Phase Lock Loop	
Modulation	Spread Spectrum	Digital
Operating Temperature	0° to 50° C (+32° F to + 122°F)	
Base Unit		
Receive/Transmit Frequency	902~928 MHz	
Power Requirements	10VDC from supplied AC adapter	
Size	Width – 4.25 inches Depth – 7.5 inches Height – 2.25 inches	Width – 4.25 inches Depth – 7 5/8 inches Height – 2.25 inches
Weight	Approximately 15.4 oz.	Approximately 13.7 oz.
Handset		
Receive/Transmit Frequency	902~928 MHz	905~925 MHz (30 channels)
Power Requirements	Nickel-cadmium battery pack (BT2499) NI-MH Battery Pack (BT2499A)	Ni-MH Battery Pack
Size	Width – 2 1/5. inches Depth – 1 2/3 inches Height – 8 2/3 inches with antenna	Width – 2. inches Depth – 1.25 inches Height – 5.5 inches without antenna
Weight	Approximately 8.8 oz. with battery	Approximately 5.2 oz. with battery
Battery	Capacity – 800 mAh, 3.6V Talk Mode – 6 hours (typical) Standby Mode – 4 days (typical)	Capacity – 800 mAh, 3.6V Talk Mode – 7 hours (typical) Standby Mode – 5 days (typical)

2000-series Telephones

The 2000-series digital telephones consist of four models:

- DKT2010-S – 10-Button Digital Speakerphone
- DKT2020-S – 20-button Digital Speakerphone
- DKT2010-SD – 10-Button Digital Speakerphone with Liquid Crystal Display
- DKT2020-SD – 20-Button Digital Speakerphone with LCD
- DKT2020-FDSP – Same as DKT2020-SD with Full-duplex Speakerphone

2000-series Telephone Option PCBs

Table 11-9 2000 Telephone Subassembly Upgrades

Subassembly	No. per Phone	Function
BVSU or DVSU[1]	1	**Off-hook Call Announce (OCA):** Provides interface for digital telephone to receive Speaker OCA. Not required for Handset/Headset OCA.
BHEU or HHEU	1	**Headset and loud ringing bell telephone interface**: Can be installed with DVSU or DADM, but not with the Full-duplex Speakerphone External Microphone (RFDM). (See "Telephone Headset (BHEU) Upgrade" on page 11-7 for installation instructions.)
DADM2020[1]	1 or 2	**ADM, DSS:** Provides telephone with 20 (or 40 with two DADMs) additional feature buttons for DSS, System or Station speed dial, or CO line appearances.

1. Only one of these subassemblies is allowed per telephone: DVSU, BPCI, PDIU-DI or DADM.

Telephone Speaker Off-hook Call Announce Upgrade (DVSU/ BVSU)

To receive Speaker Off-hook Call Announce (OCA) calls over the digital telephone speaker, a 2000-series digital telephone must be upgraded with a DVSU or BVSU; the telephone making the call does not require a DVSU or BVSU. Digital telephones do not require an additional wire pair to receive Speaker OCA call.

BVSU/DVSU Upgrade Installation for DKT2000-series Telephones

1. Loosen the four captive screws on the telephone base and remove it (see Figure 11-24 on page 11-27).
2. Loosen the four captive screws on the metal plate to the standoffs inside the base. Remove and discard the plate.

3. For the BVSU only, make sure that the SW1 and SW2 pins are set per Figure 11-30 and Table 11-5 on page 11-5.

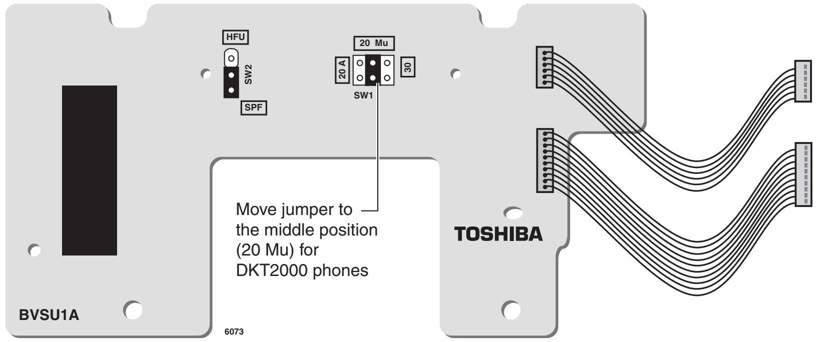


Figure 11-30 Speaker Off-hook Call Announce Upgrade (BVSU1A)

4. Position the BVSU/DVSU PCB on the standoffs), and secure with the four provided screws (see Figure 11-31).
5. Connect the BVSU/DVSU wire plugs to the VSU connectors on the PCB inside the phone.
6. Reinstall the telephone base. Secure it with its four captive screws.

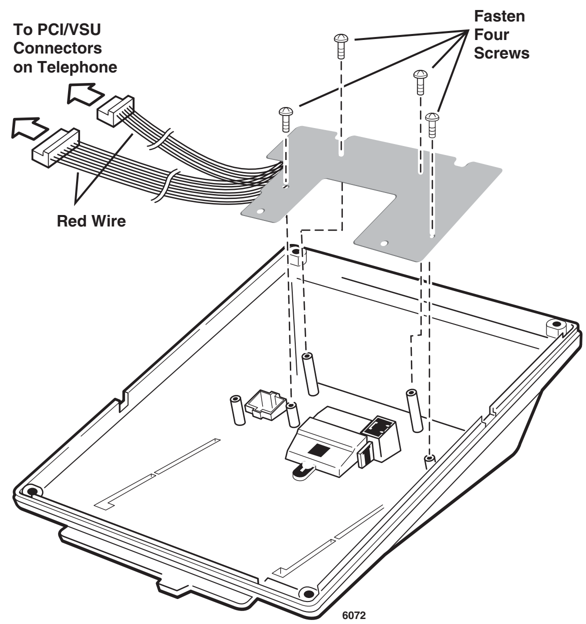


Figure 11-31 BVSU/DVSU Installation

HHEU Installation

See Figures 11-24 and 11-32~11-35 and follow these steps:

1. Loosen the four captive screws on the telephone base, and remove the base.
2. Use a screwdriver or other suitable tool to remove the plastic tab on the back of the base. (The HHEU modular connector for the headset is accessed through this opening.)
3. If installing a V.3 HHEU1, set the SW601 switch on the HHEU to headset for the headset or loud bell application.

   V.4 HHEU1 and HHEU2 do not have this switch, because they are automatically set for the headset/loud bell application.

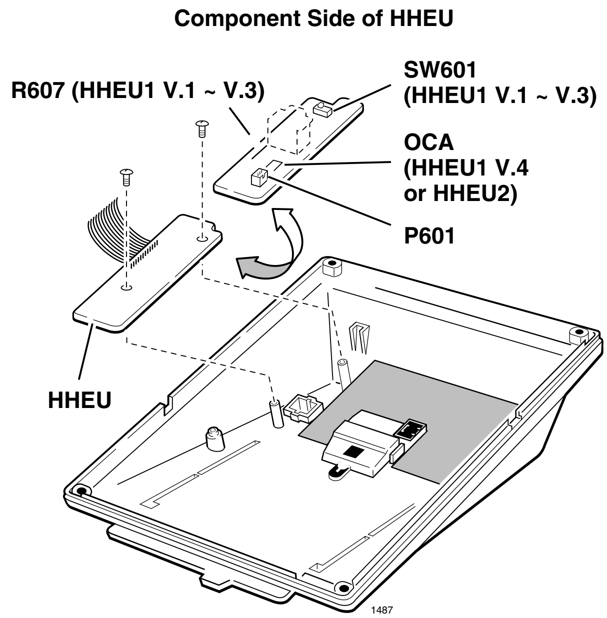


Figure 11-32 HHEU Installation

4. Connect the HESC-65A cable to P601 of the HHEU (both HHEU1A versions and the HHEU2 have P601) if the Loud Ringing Bell option is required.

   Refer to Chapter 12 – Peripheral Installation for HESB installation procedures.
5. For the V.3 HHEU1: If only the headset is connected to the HHEU, cut both sides of the R607 resistor, then remove the resistor to eliminate electrical contact.

   Note Do not cut the R607 resistor if connecting an HESB to the HHEU for the Loud Ringing Bell–even if a headset is also installed on the HHEU.

   ...or

   For the V.4 HHEU1 and the HHEU2: if only the headset is connected to the HHEU, cut the speaker OCA strap.

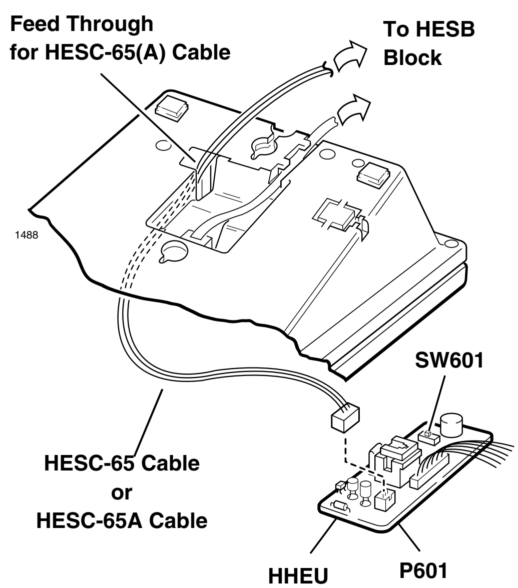


Figure 11-33 HESC-65A Cabling

Note Do not cut the speaker OCA strap if connecting an HESB to the HHEU for the Loud Ringing Bell–even if a headset is also installed on the HHEU.

6. Position the HHEU PCB on the standoffs inside the base, and secure with the two provided screws.

Note See Figures 11-34~11-35 for Steps 7~8.

7. Connect the wire plug of the HHEU PCB to the HHEU connector on the PCB in the phone.
8. If an HESB will be connected to the HHEU (for Loud Ringing Bell), locate the EX.SP strap on the PCB in the telephone and *cut* the strap.
9. If a headset will be connected to the HHEU, locate and *cut* the HHEU strap on the PCB in the phone.

Note If the HHEU PCB is removed from the phone, the HHEU strap must be replaced for proper telephone operation.

10. Reinstall the telephone base; secure with the four captive screws.

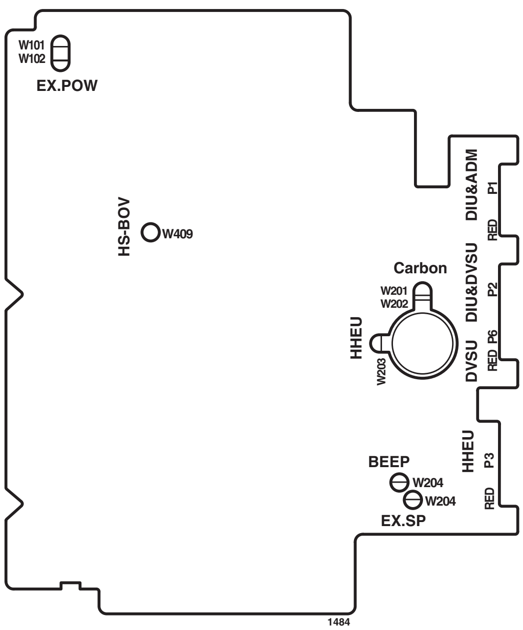


Figure 11-34 DKT2010-S Strap and Connector Locations

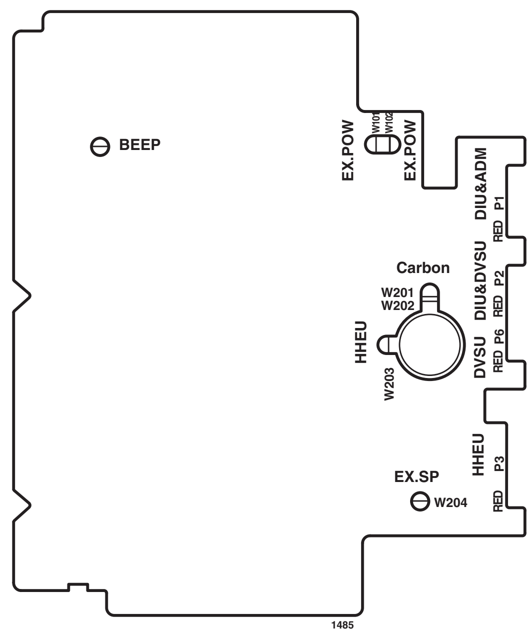


Figure 11-35 DKT2010-SD, DKT2020-S, and DKT2020-SD Strap and Connector Locations

Notes

- There are two types of HHEUs: the HHEU1 (which has four versions, V.1~V.4) and the HHEU2.
- 2000-series digital telephones require either an HHEU2 or a V.3 or V.4 HHEU1 for HESB operation; earlier HHEU1 versions are only sufficient for headset operation only.
- Only digital telephones equipped with an HHEU2 can be wall mounted. The HHEU2 is identical to the V.4 HHEU1, except that the HHEU2 has longer wires to accommodate wall mounting.
- A Toshiba HESC-65A cable is required to connect the HHEU in a digital telephone to the HESB.

➤ **To adjust the volume of the HESB Loud Ringing Bell**

1. Call the telephone connected to the HESB.
2. Adjust the volume control on the back of the HESB and the ring volume control on the telephone.

Note TAPI and Simultaneous Voice and Data Upgrades (RPCI-DI or PDIU-DI2) for 2000-series Telephones is not available on the Strata CTX.

Carbon Headset/Handset Straps

If a carbon-type handset or headset is connected to the handset jack on the side of the telephone, two jumper straps inside the telephone must be cut.

➤ **To cut the straps**

Note You do not need to cut these straps if the headset is connected to the HHEU.

See Figures 11-24 and 11-34~11-35 and follow these steps:

1. Loosen the four captive screws on the telephone base, and remove the base.
2. For 2000-series digital telephones, and cut the W201 and W202 carbon straps.
3. Reinstall the telephone base, and secure it with its four captive screws.

Beep Strap

A “beep” sounds whenever a dial pad or feature button is pressed on a digital telephone.

➤ **To eliminate the beep sound**

See Figures 11-24 and 11-34~11-35 and follow these steps:

1. Loosen the four captive screws from the telephone base and remove the base.
2. Cut the beep strap.
3. Reinstall the telephone base, and secure it with its four captive screws.

Microphone/Speaker Sensitivity Adjustment (Speakerphones Only)

High ambient noise levels may cause the speaker on some digital telephone speakerphone models to cut off frequently.

➤ **To reduce sensitivity to loud surrounding noise**

➤ Hold down `Mic` button, then press the `Vol` ▲ button. The less-sensitive level will be set after the third flash of the Mic LED.

➤ **To reset the sensitivity back to the normal level**

➤ Hold down the `Mic` button, then press the `Vol` ▼ button. The normal level will be set after the third flash of the Mic LED.

Note On speakerphone models that are set for low sensitivity, the Mic LED flashes at the in-use rate when the speakerphone is used. When set to normal sensitivity, the Mic LED is on steady when using the speakerphone.

Busy Override and Camp-on Ring Tone Over Handset/Headset Option

Busy override and camp-on ring tones can be sent over the DKT handset or headset, in addition to the speaker.

➤ **To send busy override/camp-on ring tones over the handset of the DKT2010-H model**

1. Loosen the four captive screws on the telephone base (Figure 11-24), and remove the base.
2. Install a strap in the HS-BOV W409 location (see Figure 11-34).
3. Reinstall the telephone base.

➤ **To send busy override/camp-on ring tones over the handset/headset of the DKT2010-SD/ 2020-S/2020-SD**

➤ Hold down the `Redial` button and press the `Vol` ▲ button.

➤ **To block the tone over the handset/headset of the DKT2010-SD/2020-S/2020-SD**

➤ Hold down the `Redial` button and press the `Vol` ▼ button.

Note For this to function properly with headsets, make sure the speaker OCA strap or R607 is cut on the HHEU PCB and the HHEU strap is cut on the telephone. (See Figures 11-32, 11-34 and 11-35).

External Power Straps

Digital telephones equipped with options such as integrated data interface units and ADMs require two-pair wiring or external power to operate efficiently at the maximum-allowed distance from the KSU. Two-pair wiring or external power is also necessary for maximum cable run lengths for digital telephones that are connected to systems that must operate with reserve power (see Chapter 4 – Strata CTX670 Installation for more information).

Each digital telephone has two external power straps which must be cut for external power when the cabling of the telephone is connected to an external AC/DC power supply.

➤ **To cut the straps**

See Figures 11-24 and 11-34~11-35 and follow these steps:

1. Loosen the four captive screws on the telephone base and remove the base.
2. Depending on the telephone, locate the W101 and W102 external power straps and cut them.
3. Reinstall the telephone base, and secure it with its four captive screws.

Note Refer to Chapter 10 – MDF PCB Wiring for external AC/DC power supply ordering information and installation instructions.

DIP Switches

The DKT2000 V.4 series telephones have DIP switches that enable use for the international market. The DIP switches are located underneath the flexible button key strip on the DKT2000 V.4 series telephones (see Figure 11-36). On the DKT2001, the DIP switch is located on the base.

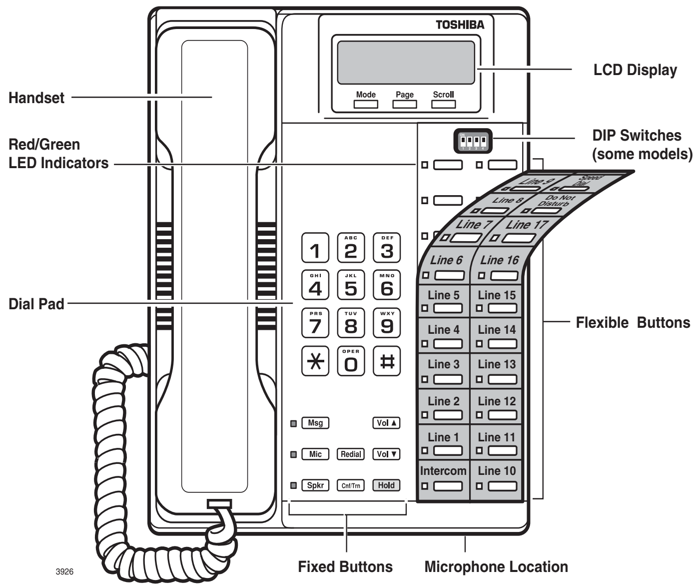
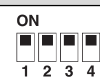
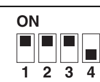
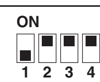
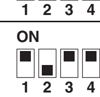


Figure 11-36 DKT 2000-series V.4 DIP Switches

Table 11-10 shows the correct country settings for the DKT2010-S, DKT2020-S, DKT2010-SD, DKT2020-SD, DKT2001 V.4 telephones.

Note The default DIP switch settings are preset for the USA and Canada. Therefore, you do not need to adjust any of these from the default factory settings for North America.

Table 11-10 DKT International DIP Switch Settings

Country	DIP Switch				DIP Switch Position
	1	2	3	4	
USA and Canada (Default Setting)	ON	ON	ON	ON	
Mexico	ON	ON	ON	OFF	
Taiwan	OFF	ON	ON	ON	
Hong Kong Thailand[1]	ON	OFF	ON	ON	
Singapore, Malaysia, Indonesia, Sri Lanka, India and China	OFF	OFF	ON	OFF	

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1. The DKT2000 V.4 is not compatible for Hong Kong and Thailand. Use the V.4A or later versions in these two countries.

DKT2020-FDSP Full-Duplex Speakerphone with External Microphone

The DKT2020-FDSP is designed to allow both parties of a speakerphone call to speak simultaneously. This eliminates “clipping” and enables true two-way conversation. However, when two parties are talking simultaneously, the performance is not as good as on a handset. The technology necessitates some volume loss in this situation.

An optional External Microphone can be connected for improved performance. However, the External Microphone is extremely directional and should only be used in certain applications. The telephone also provides half-duplex/full-duplex manual selection.

The DKT2020-FDSP has three operational modes for enhanced microphone use (Best, Good and Normal). These modes allow adjustments for different room acoustical characteristics. Choosing either the Internal or External Microphone (RFDM) and proper operational mode should be pre-selected by the system installer.

When the External Microphone option is installed, the telephone’s Internal Microphone is disabled on all but Voice First Handsfree Answerback calls and OCA calls. The External Microphone is powered by the phone (no batteries are required) and does not need to be turned off when not in use.

Choosing either the Internal or External Microphone is performed on the DIP switch 5, located under the keystrip (see Figure 11-35).

Important!

The DKT2020-FDSP’s full-duplex operation depends on the speaker volume setting. Raising or lowering speaker volume directly affects the performance of the full-duplex operation.

- *Depending on the room’s echo characteristics, raising the volume of the speakerphone can cause the full-duplex operation to deteriorate. When set to maximum volume, it may be necessary to switch to half-duplex operation.*
- The speakerphone will automatically reduce volume in each direction when both the FDSP user and the distant party are talking at the same time. The volume reduction is required to control the echoes at high volume levels. It is possible for surrounding conversations and other sounds to trigger this effect even when you are not speaking.
- The performance of the DKT2020-FDSP can vary on calls that involve a delay, such as wireless calls, Voice Over Internet Protocol calls, etc. With these types of calls, the quality can diminish.
- When using the [PDN] or Intercom button, the performance for internal calls is not as good as for external calls.

DIP Switches

The DKT2020-FDSP has DIP switches that enable the External Microphone and use telephone use in other countries. The DIP switches are under the flexible button key strip (see Figure 11-35).

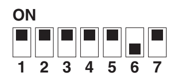
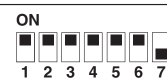
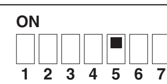
There are three different DIP switch settings for optimum operation in various types of environments:

- **Best** – provides full-duplex operation with the Internal or External Microphone. This is ideal for a large enclosed area, such as an office with little echo. Echo varies according to the environment. For instance, a room that is relatively empty has more echo than a room with furniture or items that can absorb sound waves.

- **Good** – provides full-duplex operation with the Internal or External Microphone. This is ideal for a small office with high echo.
- **Normal** – provides full-duplex operation with the Internal or External Microphone. This works well with an open office area, such as an office cubicle.

Table 11-11 shows the switch positions for the three different settings.

Table 11-11 DKT2020-FDSP DIP Switch Settings

Full Duplex Setting	DIP Switch							DIP Switch Position
	1	2	3	4	5	6	7	
Best	ON	ON	ON	ON	ON	OFF	ON	
Good	ON	ON	ON	ON	ON	ON	OFF	
Normal (Default)	ON	ON	ON	ON	ON	ON	ON	
DIP Switch 5 ON for Internal Microphone; OFF for External.								

5206

Note The first four DIP switches are used to select the country, same as all other DK2000-series telephones. The default DIP switch settings (1~4) are preset to On for the USA and Canada. If you need to make adjustments for other countries, see Table 11-10 on page 11-52.

➤ To use the External Microphone

1. Plug in the RFDM External Microphone to the bottom of the phone (see Figures 11-37 and 11-38).
2. Turn the microphone On by opening it (see Figure 11-39).

Note The High/Low switch works independently from the telephone's speakerphone. This setting must be on High for proper operation.

Important!

- *The microphone has a narrow voice pick-up range so the front of the microphone should always point toward the person speaking (see Figure 11-40).*
- *Be sure to place the microphone at least one foot from the telephone speaker and do not point the microphone toward the telephone speaker grille.*
- *To use the external microphone in a conference room setting, place the microphone away from all parties to eliminate some of the directional effect. Parties may have to speak up to be heard.*
- *The RFDM External Microphone is not compatible with the HHEU or BHEU.*

CAUTION! Avoid pulling the microphone cord excessively.

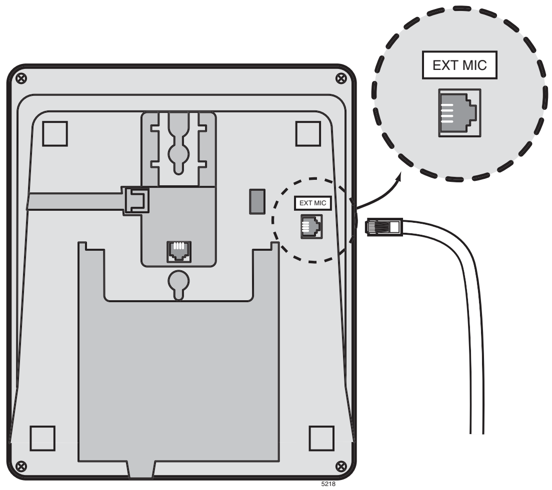


Figure 11-37 RFDM Plug on DKT2020-FDSP

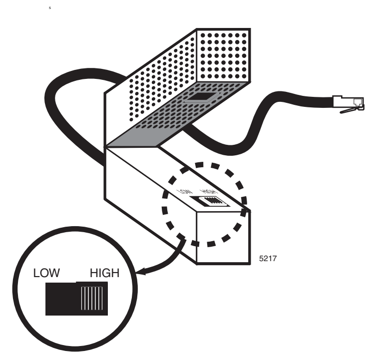


Figure 11-38 RFDM Unit

Figure 11-39 External Microphone On/Off

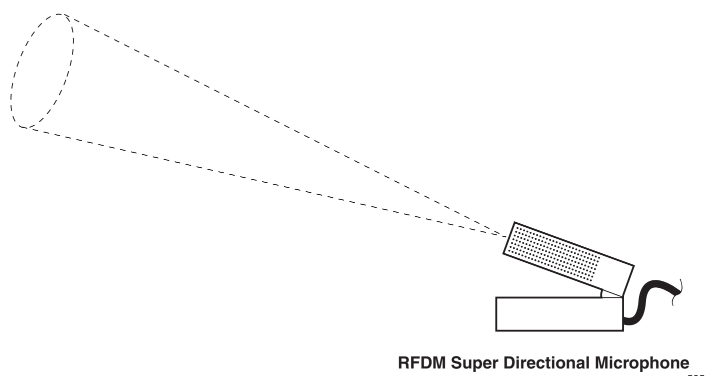


Figure 11-40 External Microphone Voice Pick-up Path

Speech Training Mode

When the DKT2020-FDSP is used in speakerphone mode, it adjusts to both the telephone line's and room's acoustic properties. At the beginning of each speakerphone call, the echo canceller must perform Speech Training by evaluating both the FDSP user and the far-end user's voice, background noise and line quality.

➤ **To train the speakerphone**

➤ The parties at both the local telephone and on the far end should take turns speaking for approximately 10 seconds.

➤ **To improve speaker quality**

➤ If the conversation becomes unstable during the call, or there is clipped speech, feedback or short silences, first try adjusting the volume. This forces the FDSP phone into speech training mode. The LED will go on.

➤ If conversation is still unstable, press button 10 to activate half-duplex mode. You can turn off button 10 at any time to reactivate full-duplex mode.

➤ **To force the telephone into Speech Training mode**

➤ During a call, momentarily press Vol▲, Vol▼, Hold or MIC.

During Speech Training mode, the speakerphone operates in half-duplex mode.

Tips for best results

- Avoid blocking the microphone or shuffling paper near the microphone.
- Avoid placing the speakerphone where it can detect excessive background noise, especially during Speech Training mode.
- Avoid moving the telephone during a call—this changes the room's acoustic properties. If the telephone or microphone is moved, you may have to force the Speech Training mode.

Special Button Operation (Button 10)

When using the external or Internal Microphone, button 10 works as a toggle from full- to half-duplex on the DKT2020-FDSP.

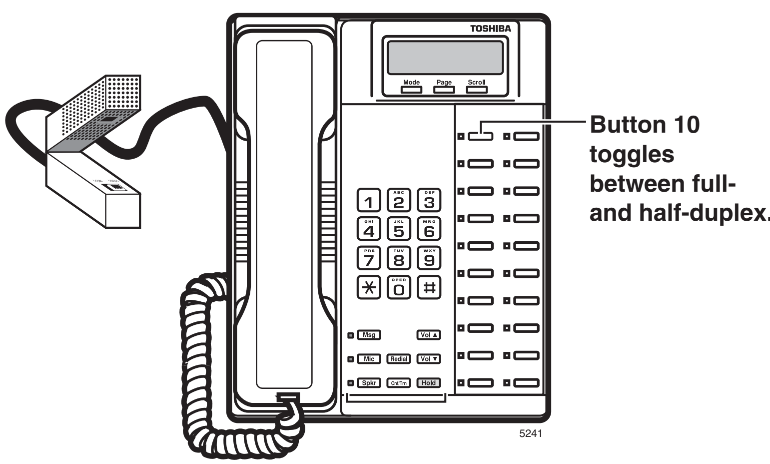


Figure 11-41 Button 10 on the Full-duplex Speakerphone

➤ To toggle full/half-duplex mode

➤ Press button 10 (see Figure 11-41) to turn full-duplex mode On or Off.

Full-duplex mode: Button 10 LED Off.

Half-duplex mode: Button 10 LED On.

Notes

- Button 10 functions the same for Internal and/or External Microphone.
- If DIP switch 6 and 7, in Figure 12, are turned Off, the Full/half-duplex function of Button 10 is disabled.
- The DKT2020-FDSP's full-duplex operation depends on the speaker volume setting. Raising or lowering the speaker volume directly affects the performance of the full-duplex operation.

Important!

- *If raising or lowering the volume does not improve performance, switch to half-duplex mode by pressing Key 10.*
- *If both you and the distant party are using full-duplex speakerphones, the sensitivity to both echo paths may cause a reduction or instability of volume. If this happens, it may be necessary to switch to half-duplex mode by pressing key 10.*

Digital Single Line Telephone (DKT2001 only)

For instructions on installing the DKT3001 SLT, see "Digital Telephone System Connection" on page 11-2.

DKT 2001 Installation

1. Set the DIP switches to match Figure 11-42. The DIP switches are preset from the factory for the USA and Canada. Refer to Table 11-10 on page 11-52 for other country settings.
2. If required to achieve maximum distance (greater than 1000 ft.), install a two-pair house cable (or external power).

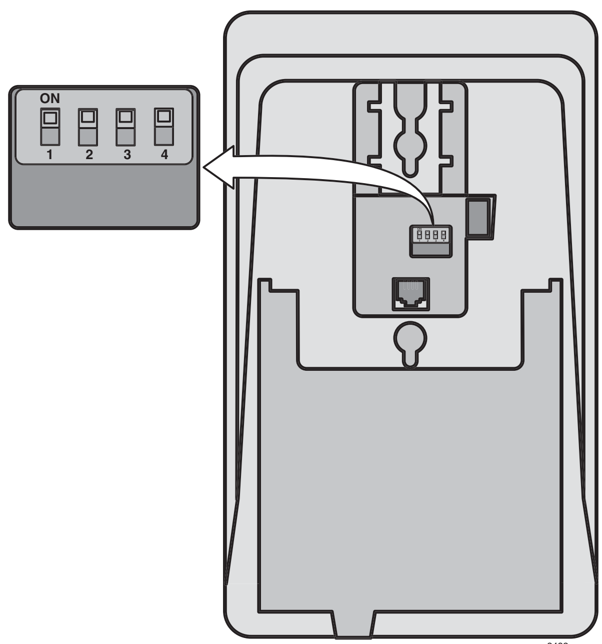


Figure 11-42 DKT2001 DIP Switch Settings

Peripheral Installation 12

This chapter provides information and diagrams for connecting peripheral equipment to the Strata CTX interface circuits. These interfaces include those listed below:

- Application PC and Server Interfaces
  - Strata CTX WinAdmin, ACD, Attendant Console, SMDI and SMDR
- Music-On-Hold/Background Music Interfaces
- External Page with BIOU Interface
- Control Relays with BIOU Interface
- Door Phone/Door Lock with DDCB Interface
- Telephone External Ringer with HESB Interface
- Amplified Page with HESB Interface
- Amplified Page/Talk-Back with HESB Interface
- Power Failure Cut-through with DPFT Interface
- Station Message Detailed Recording

Application PC and Server Interfaces

Application PCs and/or servers are connected to the Strata CTX system via a Network Interface jack, RS-232 serial ports and/or a Strata CTX modem depending on the application. These interfaces are provided by the CTX system processor. The network jack and built-in modem are standard equipment on the CTX670 processor and option PCBs on the CTX100 processor. The BSIS four-port serial interface is an optional PCB that mounts on the CTX100 or CTX670 processor (see Figure 12-1).

- **CTX WinAdmin, Stratagy VM Proprietary Integration, Attendant Console and ACD Network Interface –** These application PC/servers equipped with a standard Network Interface Card (NIC) connect to the Strata CTX network jack. One network interface jack is standard on the Strata CTX670, BBCB processor PCB. The AETS option is required on the CTX100 ACTU processor. This is the only network jack interface on the Strata CTX (see Figures 12-1~12-4).
- **CTX WinAdmin Modem Interface –** CTX WinAdmin PC servers equipped with a modem can connect the Strata CTX maintenance modem. One built-in maintenance Modem is standard on the Strata CTX670, BECU processor PCB. An AMDS option PCB is required for CTX100 ACTU processor PCB.The Strata CTX modem supports point-to-point TCP/IP connection to a CTX WinAdmin PC modem over PSTN telephone lines (see Figure 12-5 for a connection diagrams).

- **SMDR and SMDI or Stratagy VM Serial/RS-232 Interface –** Application PC/servers equipped with standard RS-232 COM ports connect to the Strata CTX serial interface ports. The Strata CTX provides four RS-232 interface jacks on the BSIS PCB. The BSIS is an optional PCB that piggy backs on the system processor PCB (see Figures 12-6 and 12-7 for a connection diagrams). Refer to the *Strata CTX Programming Manual*, Programs 803 and 804 to set up these interfaces.

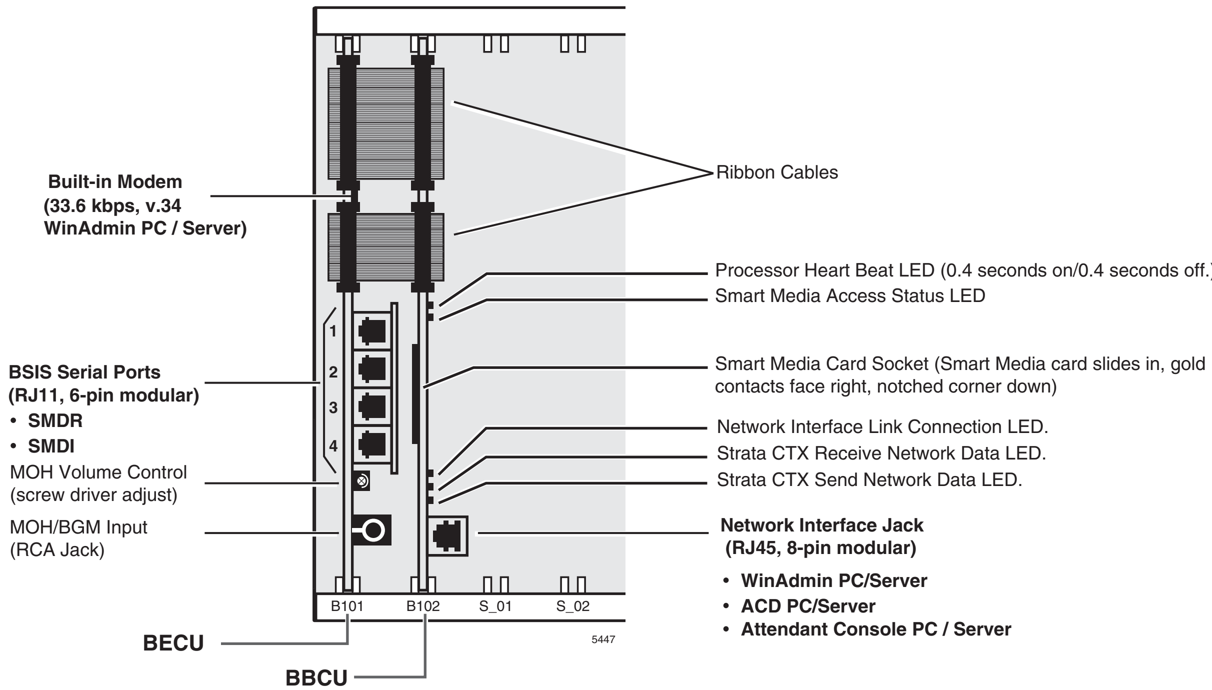


Figure 12-1 Application PC/Server Interfaces

Network Interface Connections

Figure 12-2 shows basic network interface connections. Figure 12-3 shows application PC or server direct connections. Refer to Program 801 to set up the LAN interface. Network jack wiring guidelines are listed below:

- The CTX100 and CTX670 network interface is 10BaseT and requires CAT5 twisted pair cabling.
- The maximum distance between the BBCU network jack and the application PC or server is 100 meters (328 ft.) when using CAT5 cabling without repeaters.
- Unshielded CAT5 cabling is adequate for most installations.
- Shielded CAT5 cabling is needed to protect the cable in environments that have excessive electromagnetic interference (EMI).

Network Jack LED Indications

The three LEDs located on the BBCU and AETS network jack indicate activity when sending or receiving data on the network (see Figure 12-4).

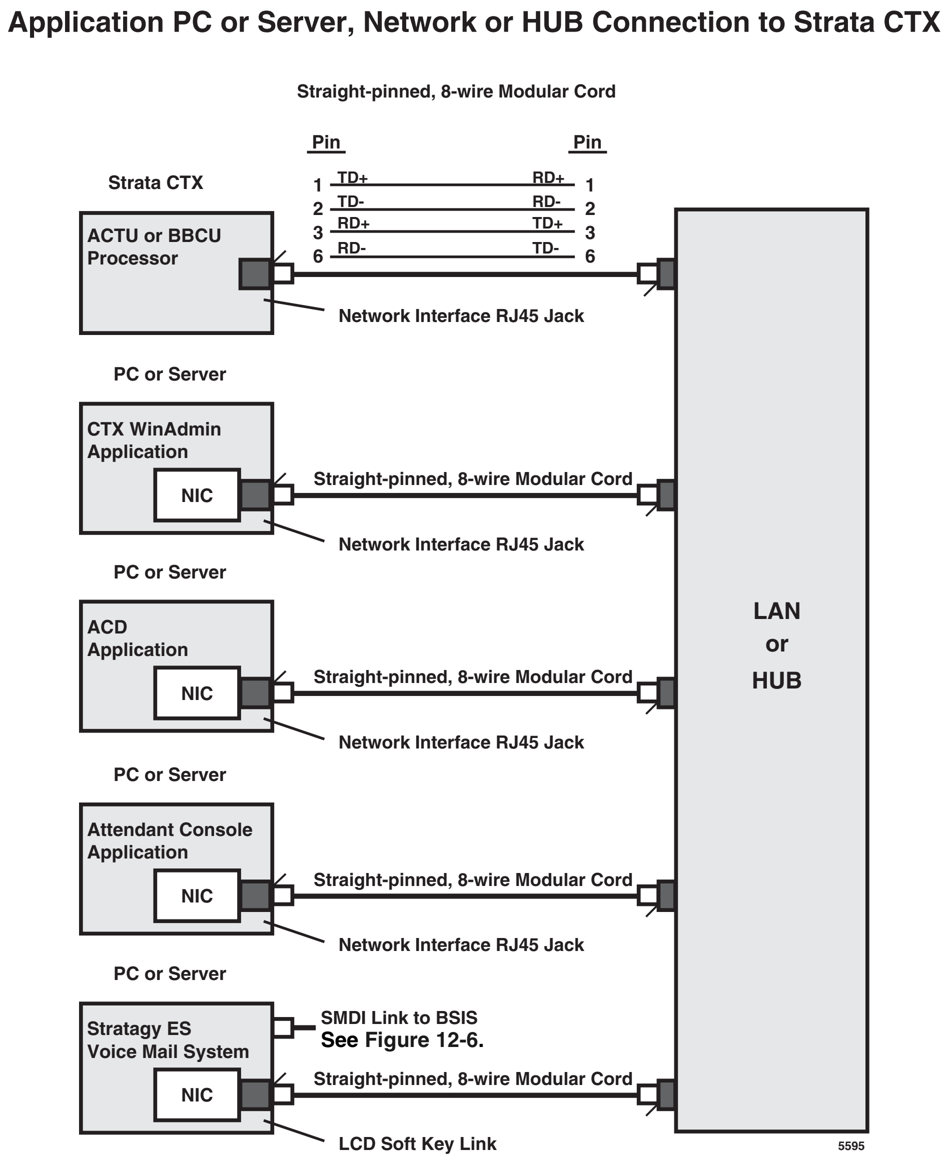
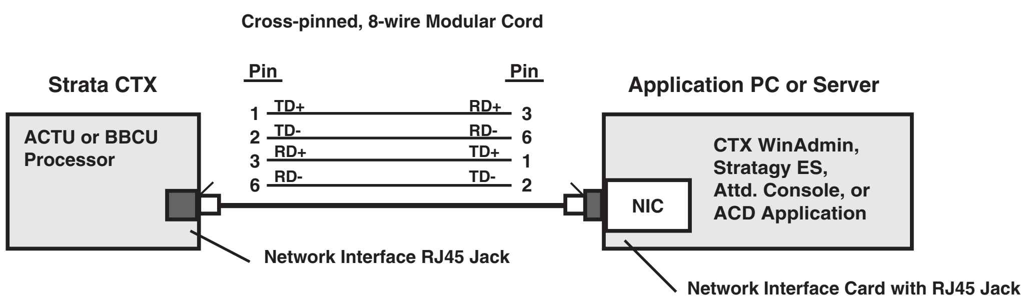


Figure 12-2 Network Interface Connections

Application PC or Server, Direct Connection to Strata CTX



Network Interface Cable Cross Pinning

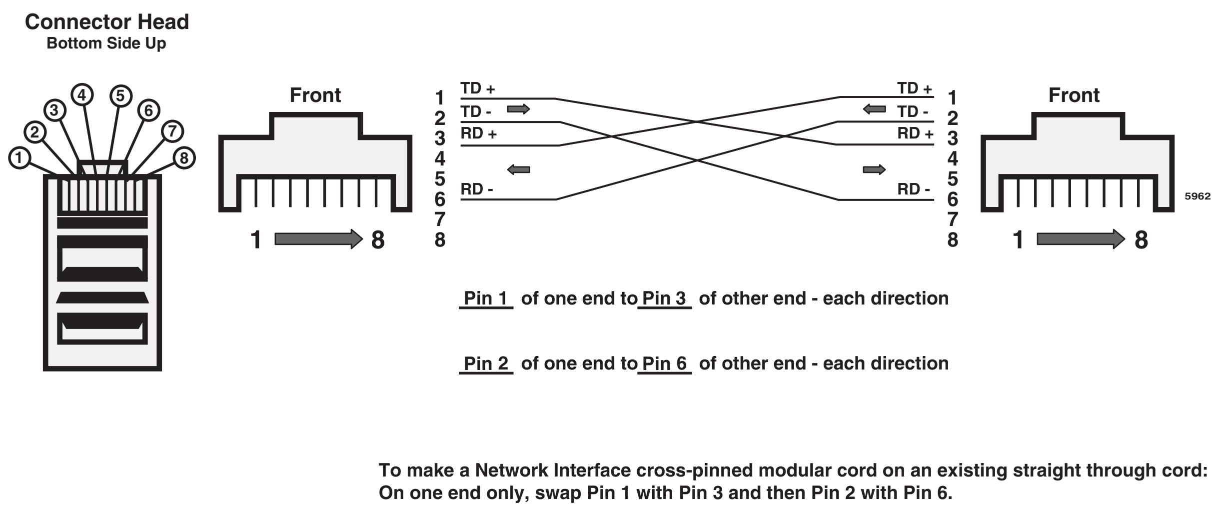
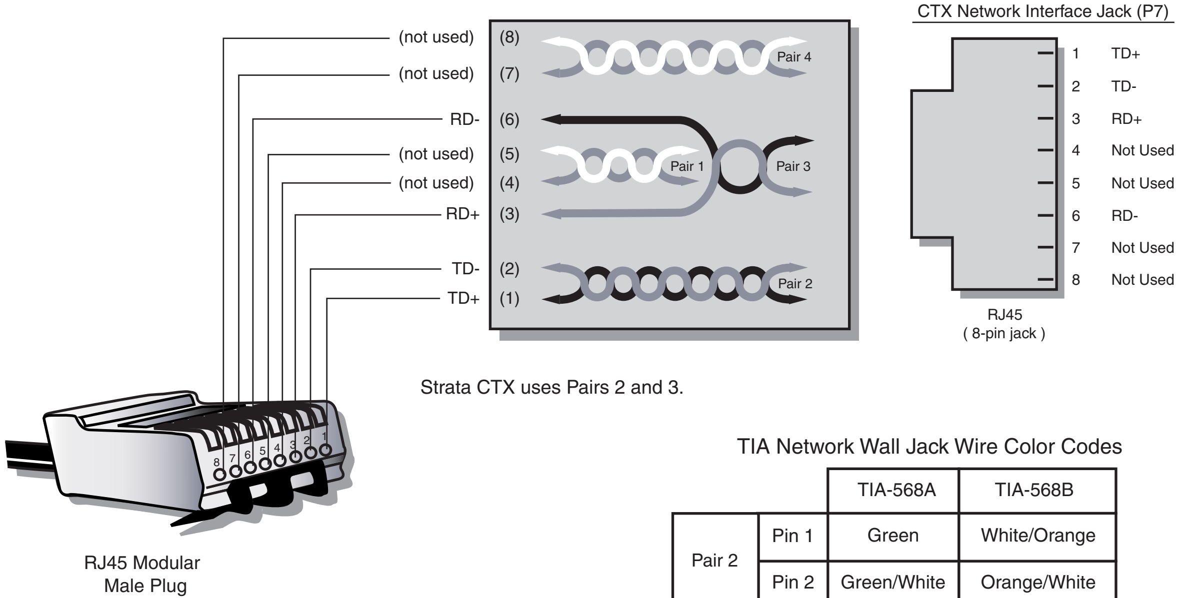


Figure 12-3 Application PC or Server Direct Connection



TIA Network Wall Jack Wire Color Codes

		TIA-568A	TIA-568B
Pair 2	Pin 1	Green	White/Orange
	Pin 2	Green/White	Orange/White
Pair 3	Pin 3	Orange/White	White/Green
	Pin 6	Orange	Green/White

CAUTION: Do not mix different TIA Wall Jack Types in an Installation.

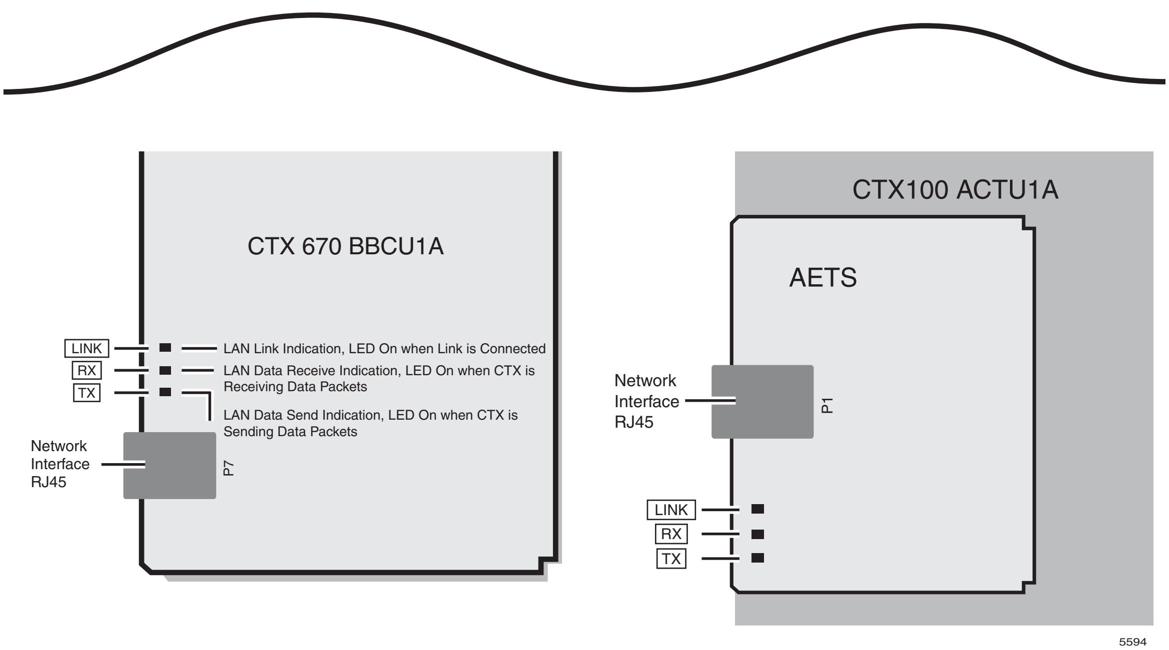
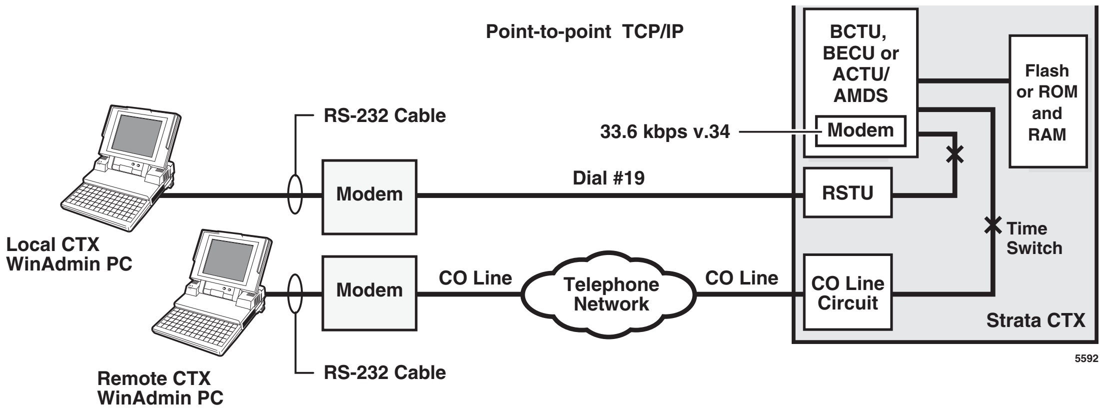


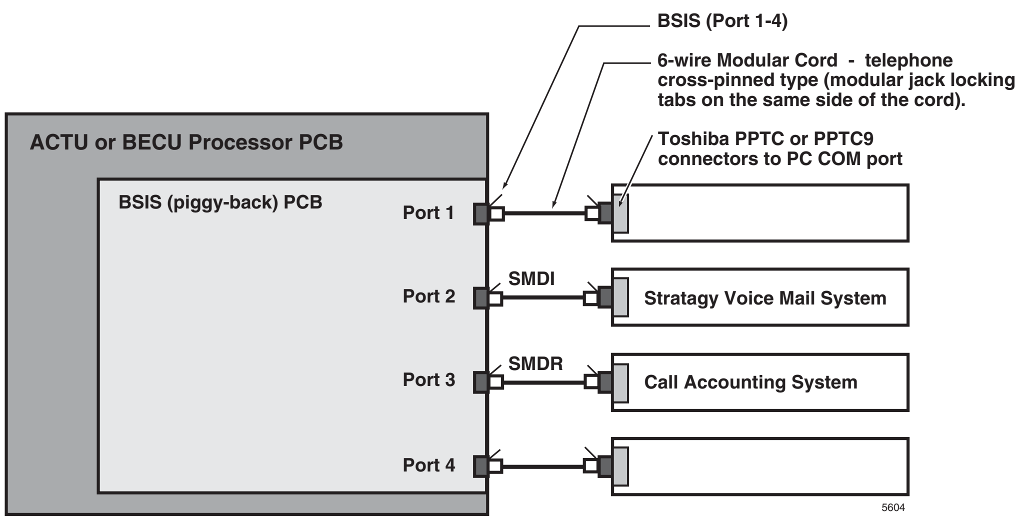
Figure 12-4 Network Interface Jack Pin Numbers and LEDs



CTX Modem Programs and Dialing Numbers
DID – Program 309: Ring direct to built-in modem.
Ground/Loop – Program 310: Ring direct to built-in modem
Transfer, Tie, or DISA – Program 102: Dial #19 to transfer to or dial the modem directly.

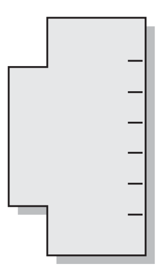
Note: The PC modem can be external or internal.

Figure 12-5 CTX WinAdmin Modem Interface Connection



Note: Total data rate four ports combined is 57.6kbps. maximum.

Strata CTX Serial Port Modular Pins:



1	→	RD	(Data from CTX)
2	←	TD	(Data to CTX)
3	→	DSR	(Data Set Ready from CTX)
4	←	DTR	(Data Terminal Ready to CTX)
5	→	CD	(Carrier Detect from CTX)
6	⏚	SG	(CTX/Terminal Signal Ground)

BSIS RJ11
(Six-pin jack)

Figure 12-6 Serial Port Interface Connections

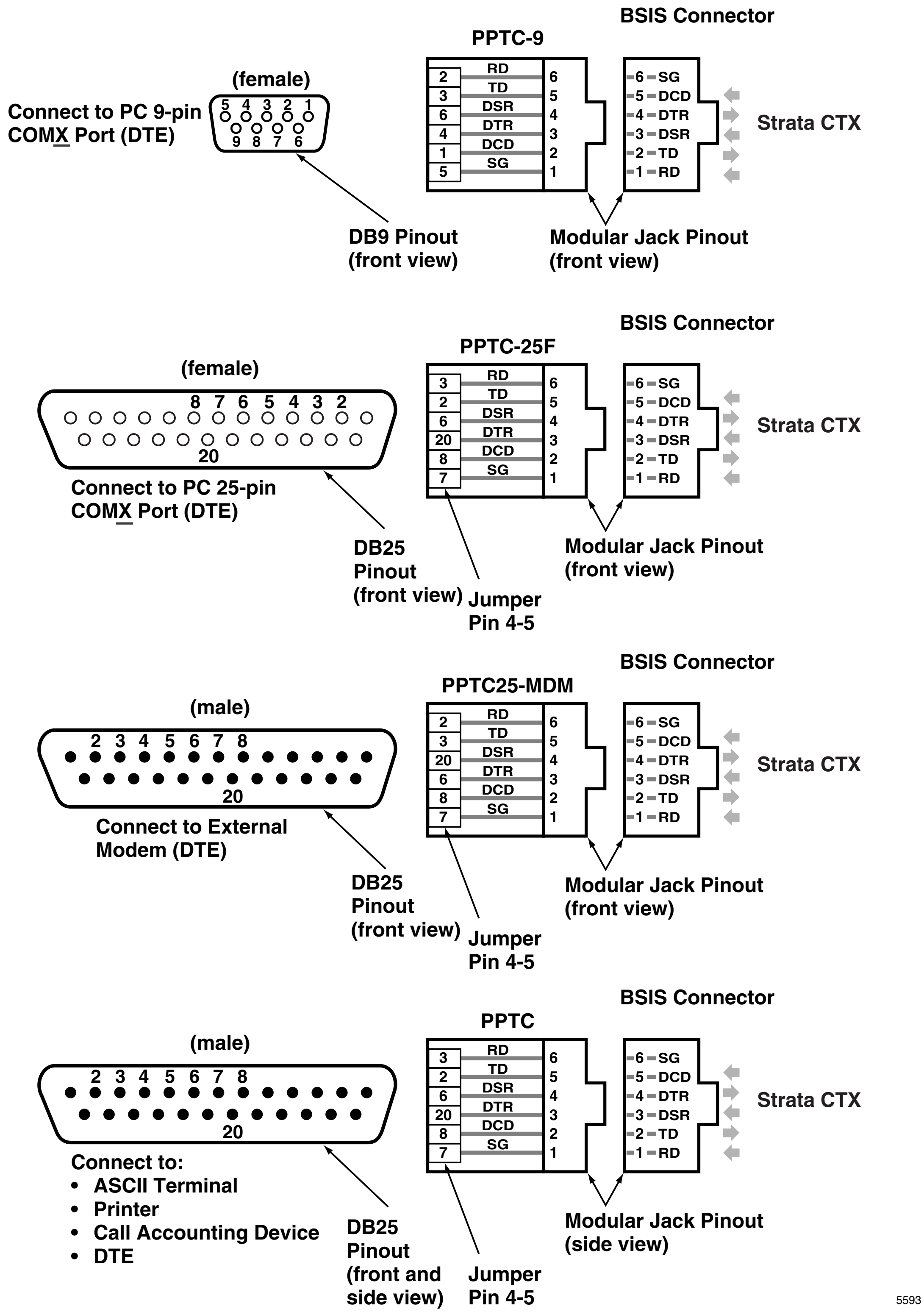


Figure 12-7 Serial Port Adaptors Pin Numbers

Music-On-Hold/Background Music Interfaces

Strata CTX provides up to 15 MOH/BGM music source interfaces via the ACTU or BECU system processor PCB, one or two BIOU optional interface PCBs, and RSTU standard telephone interface PCBs. The destination of each music source is determined by system programming. The music sources can be standard CD music players, telephony MOH machines and/or tape players, etc. The music sources are connected to standard RCA type jacks on ACTU or BECU and BIOU and via a dealer-supplied isolation transformer to RSTU (see Figure 12-8 for a connection diagram).

MOH is sent to callers placed on hold and BGM is sent to DKT telephone speakers and/or external page speakers.

The ACTU, BECU and BIOU interfaces provide an input volume level control for each music source. The volume levels of music sources connected to RSTU circuits rely strictly on the music source volume controls.

MOH/BGM source output requirements:

- Output Impedance: 600 or 8 ohms
- Output voltage level: 0.14VRMS (-15dbm) ~ 0.77VRMS (0dbm).

An additional separate BGM source can be connected to the building's external page amplifier to play music over the paging speakers when the Strata CTX Page is not in use. This interface option requires the BIOU zone relays or mute control (see External Page with BIOU Interface).

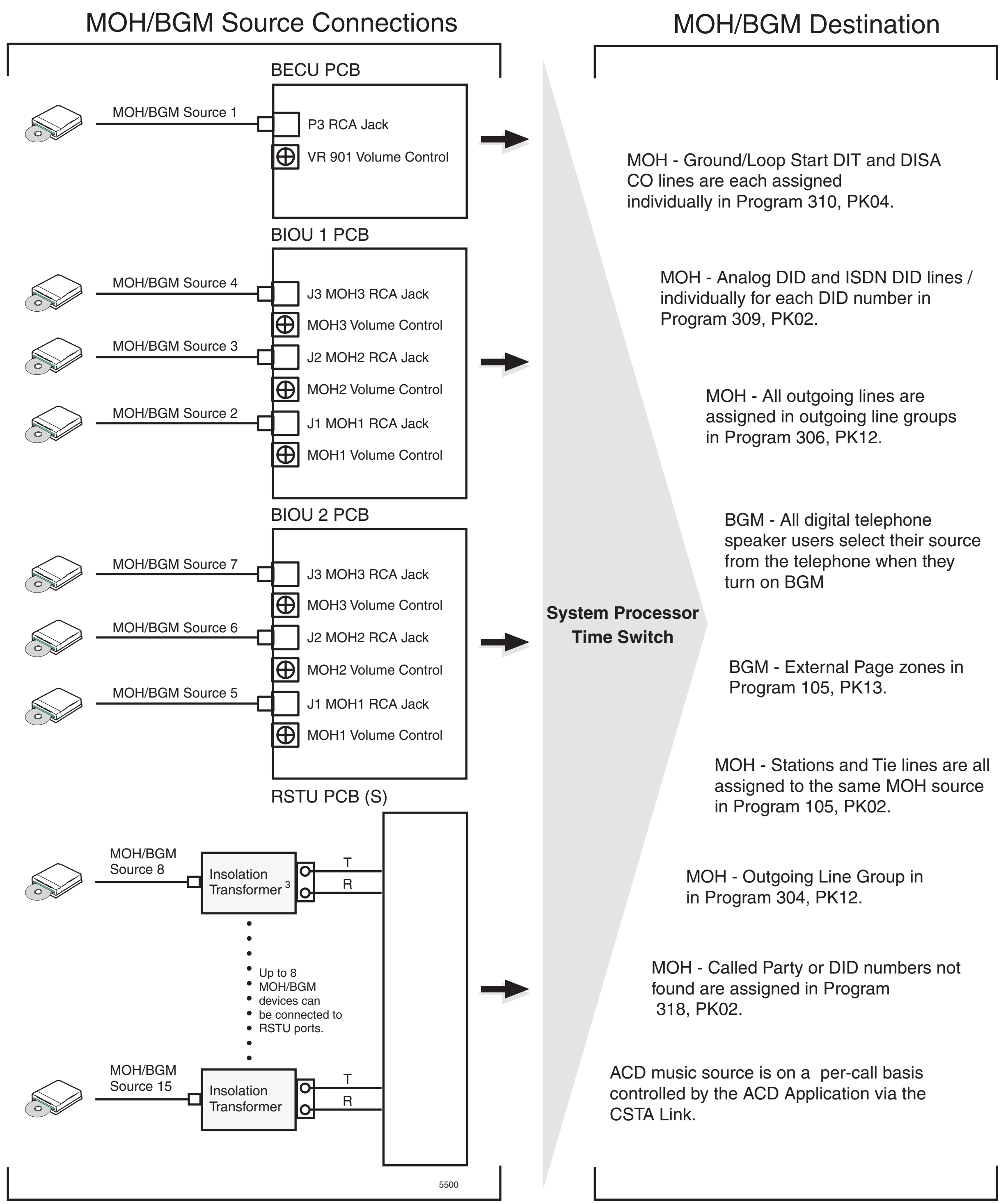


Figure 12-8 MOH/BGM Interface Connection

External Page with BIOU Interface

Up to two BIOU interfaces can be installed for connecting external page equipment. Each BIOU can provide up to four unique page zones for a total of eight page zones maximum per system. The BIOU interfaces can be installed in the main cabinets and/or any remote cabinet. Each BIOU provides a 600ohm, non-amplified page output and an 8 ohm, 3-watt amplified page output. Only one type of page output, amplified or non-amplified, can selected per BIOU in a given installation. The BIOU also provides a control relay which can be used to mute external BGM when the external page circuit is active (see Figures 12-8~12-12 for connection diagrams).

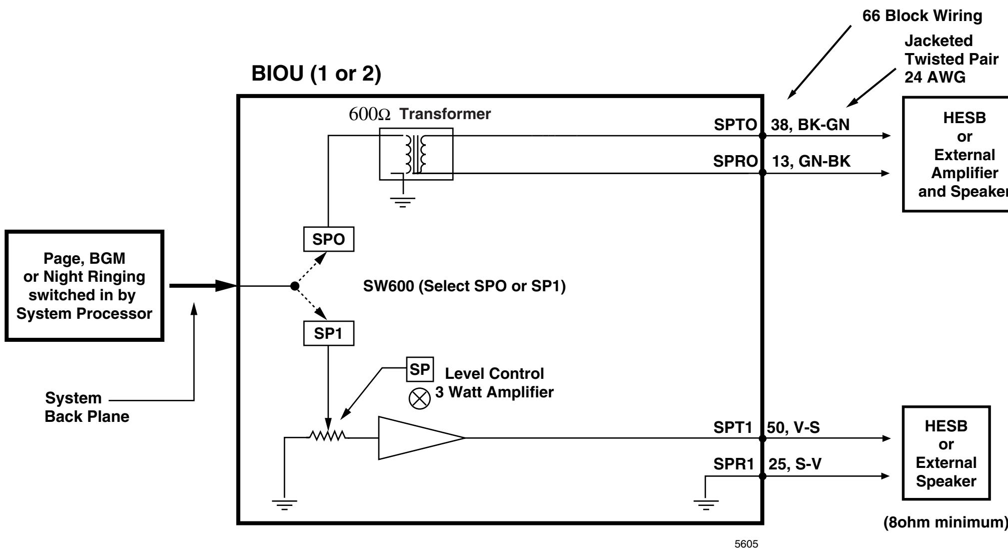
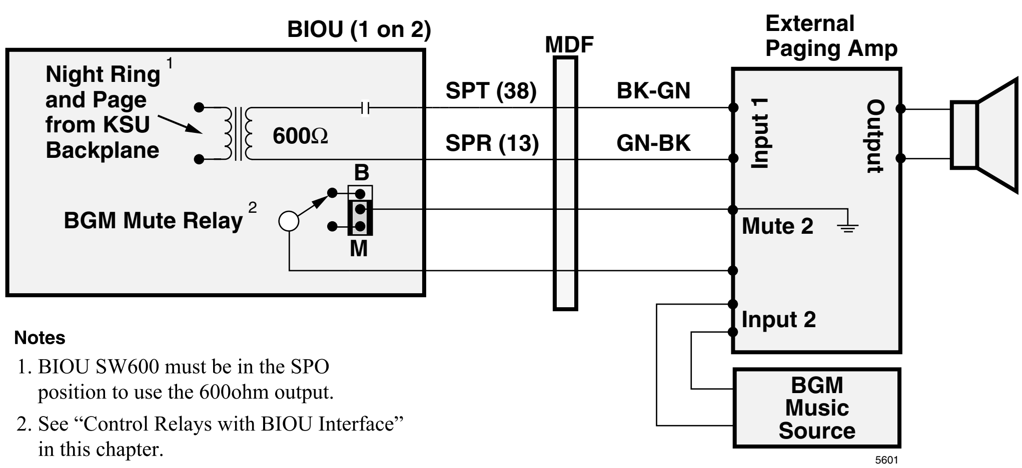


Figure 12-9 Single Zone Page Options

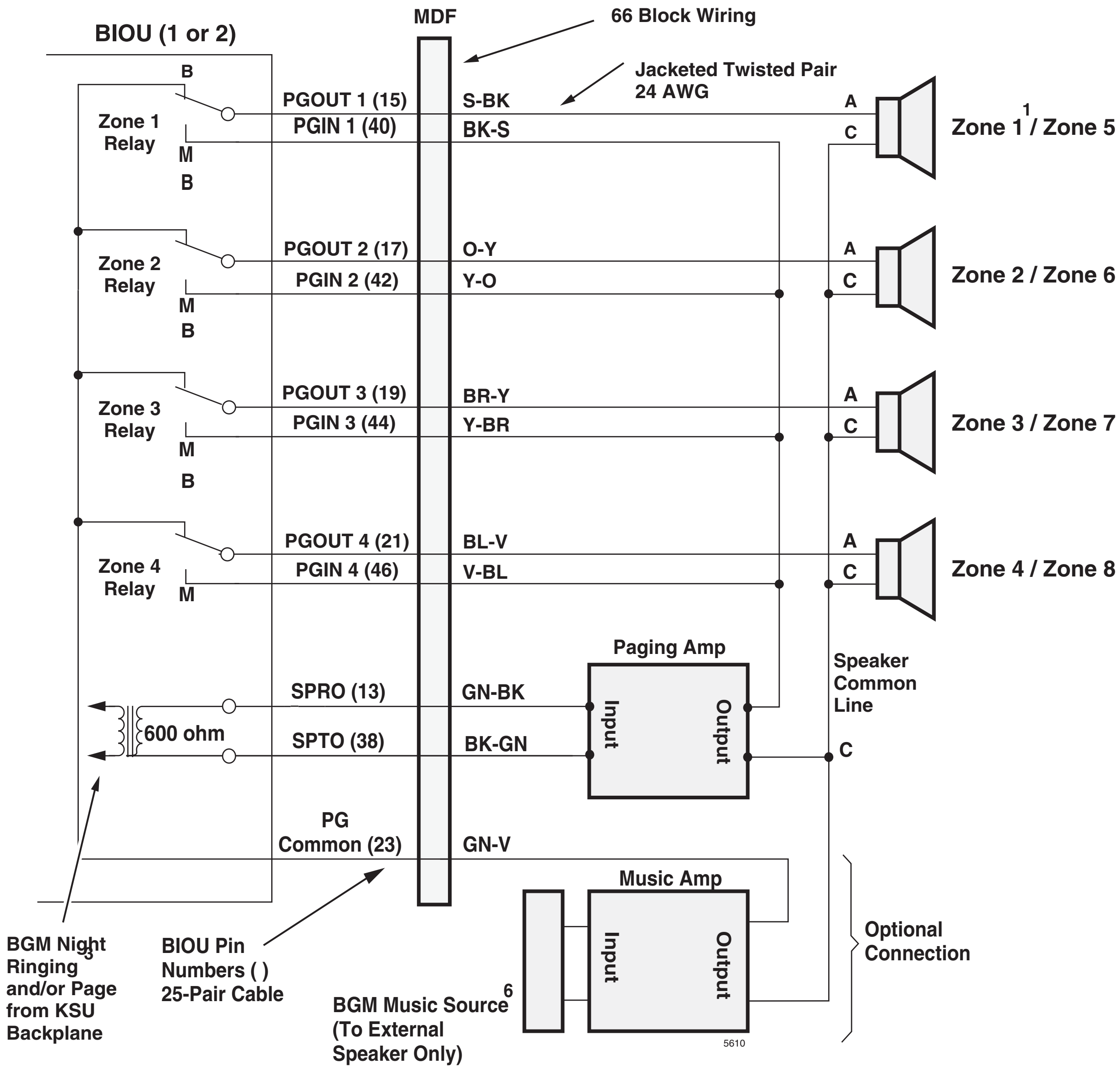
A separate external BGM source can be connected to a building's external Page speakers using the BIOU interface. This enables the BGM sent over the external page speakers to be different from the BGM sent to telephone speakers (see Figures 12-10) for separate BGM over external Page connections).



Notes

1. BIOU SW600 must be in the SPO position to use the 600ohm output.
2. See "Control Relays with BIOU Interface" in this chapter.

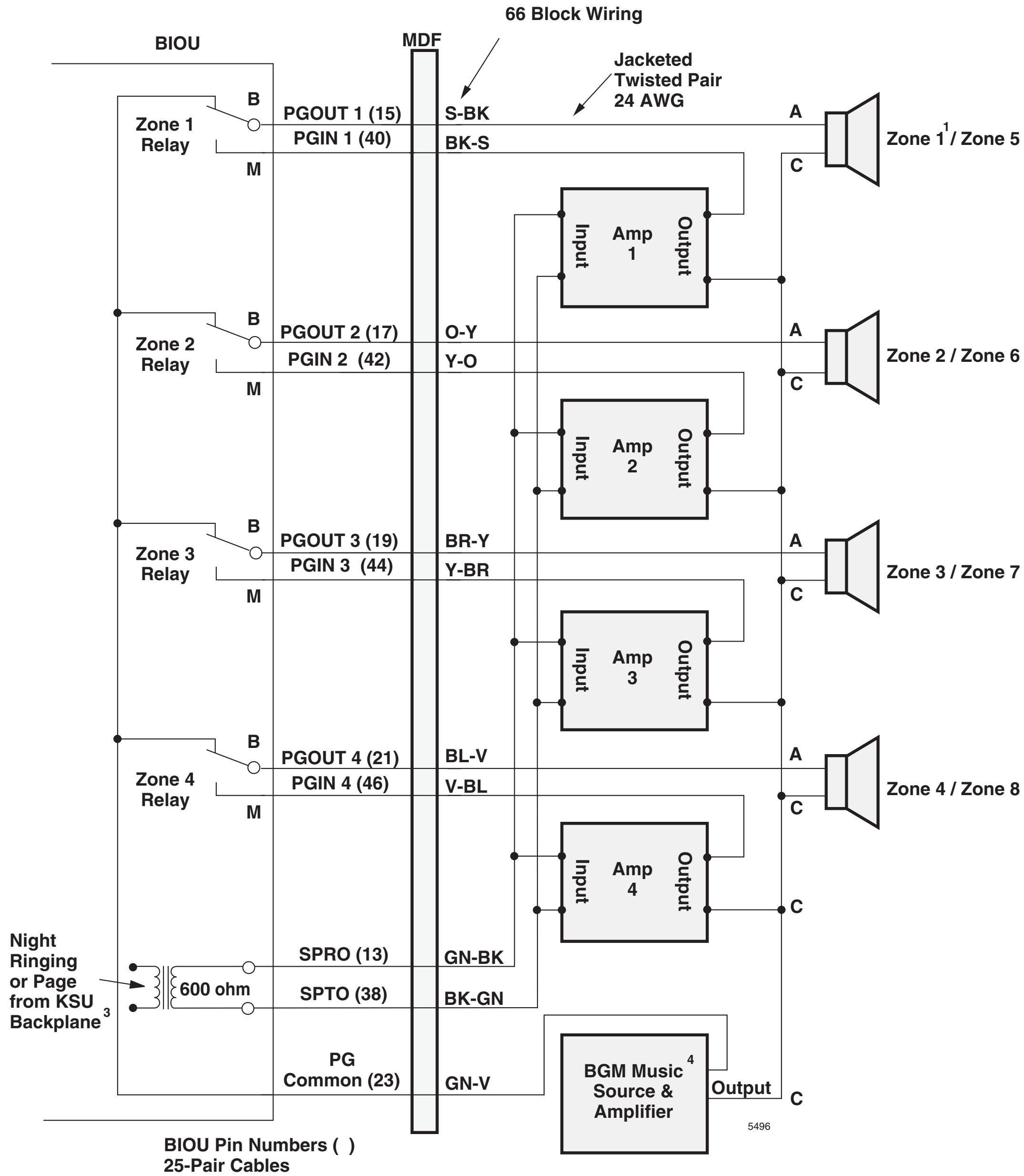
Figure 12-10 Separate BGM Over External Page



Notes

1. Zones 1~ 4 are provided by the BIOU designated BIOU #1.
2. Zones 5 ~ 8 are provided by the BIOU designated BIOU # 2.
3. BIOU SW600 must be set to SPO for 600 ohm page output.
4. Page Zones are added to Page Groups in Program 503.
5. External BGM mute relay control can be provided using BIOU control relay (see Figure 8-12).
6. BGM over External Page with an external Music Amp is optional.
7. BGM via 600 ohm output (SPRO/SPTO) is sent to selected Page Zones per Program 105, FB13 and Program 503.

Figure 12-11 Zone Page with One External Amplifier



The Notes in Figure 12-11 also apply to this figure.

Figure 12-12 Zone Page with Multiple Amplifiers

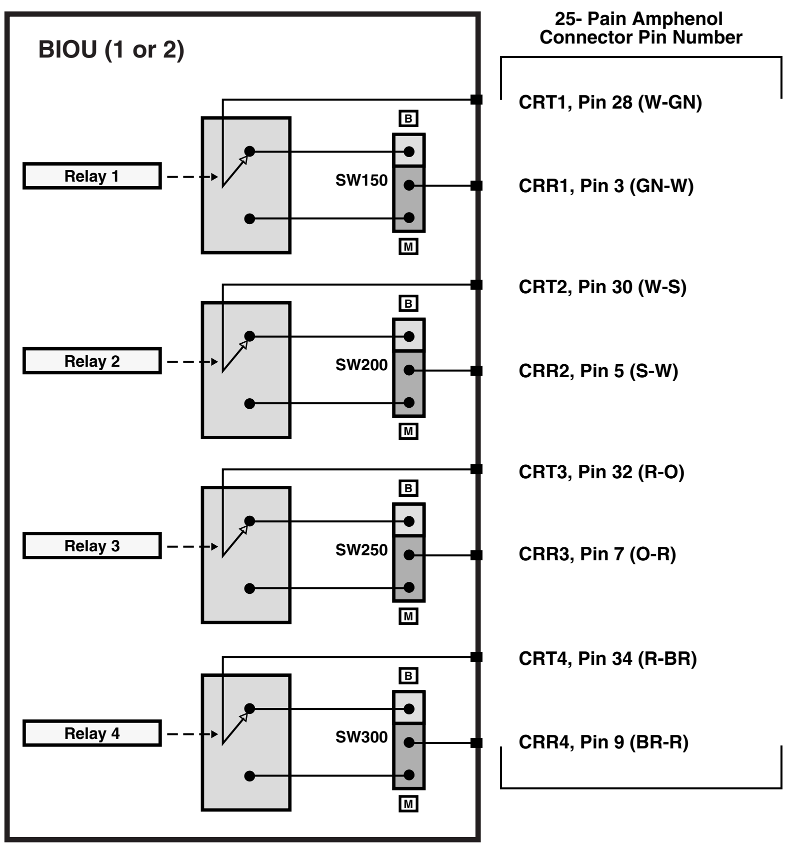
Control Relays with BIOU Interface

Up to two BIOU interfaces can be installed to provide control relays for Night Bell, Night Transfer, Door Lock and BGM mute control. Each BIOU provides four control relays for a total of eight relays (max.) per system. Each relay's function is selected in system programming. BIOU interfaces can be installed in the main cabinets and/or any remote cabinet (see Figure 12-8).

BIOU control relay contact power ratings are shown below:

- 24 VDC maximum
- 1.0 amperes maximum

CAUTION! **BIOU relay contacts are not rated to switch 120/240VAC, connecting these voltages may result in equipment damage, fire and/or personal injury.**



Notes

1. User Relay Service Program 515 to set control relay for Night Bell, Night, Door Lock, External BGM mute functions as required.
2. Relay functions can open or close contacts by setting Make/Break switches SW150~SW300.
3. Relay functions are set in Programs 503, 508 and 515.
4. Relay contacts are rated at 24 VDC, 1.0A maximum. Do not connect to 120VAC.

Figure 12-13 BIOU Control Relays

Door Phone/Door Lock with DDCB Interface

The Strata CTX supports up to eight DDCB door phone control boxes. Each DDCB supports up to three MDFB door phones which provides a total of up to 24 door phones (see Figure 12-15). Each DDCB can provide a door unlock control relay in place of one of the door phones.

DDCB and MDFB Cabling

For DDCB and MDFB wiring/interconnecting details and door lock control installation procedures and secondary protection information, refer to Chapter 10 – MDF PCB Wiring. If using 24 AWG cable, the length of the cable run from the Strata CTX to the MDFB (via the DDCB) must not exceed 1,000 feet (305 meters).

- DDCB cable runs must not have cable splits (single or double), cable bridges (of any length) or high resistance or faulty cable splices.

DDCB Wall Mounting

The DDCB is designed to be mounted on a wall or other vertical surface.

➤ **To mount the units**

1. Locate the two mounting holes on the right-hand side on the DDCB (see Figure 12-14).
2. Remove the side cover from the DDCB to expose the two left-hand mounting holes.
3. Position the DDCB adjacent to the Base KSU with regard to wiring needs.
4. Secure the DDCB to the mounting surface with four one-inch panhead wood screws.

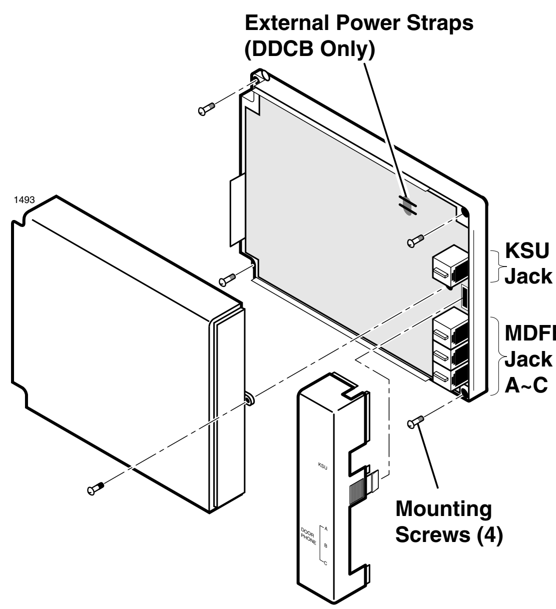


Figure 12-14 Door Phone (DDCB) Installation

Door Phone Wire Connections

Up to 24 door phones can be connected to the Strata CTX system. Door phones are connected as follows: Up to three MDFB, door phones can connect to a single DDCB door phone control box, which in turn connects to a single DKT interface port (See Figure 12-16 for door phone wiring diagram). Only one of the three connected door phones can be active at a given point in time.

Calling from a Door Phone

Each door phone has a push button that rings selected telephones with one of three unique bing-bong sounds. The door phone's location displays on ringing telephone LCDs. The three bing-bong ring types are permanently assigned to each of the DDCB ports (A, B and C) as shown in Figure 12-16. Door phones can also be programmed to ring over the system's external paging equipment. When a telephone answers a door phone call, a two-way talk-path is established between the calling door phone and the called telephone.

Calling a Door Phone

Each door phone has a unique number (#15XX, where "XX" = 01~24 max., depending on system size) that can be dialed from system telephones. When a system telephone calls a door phone, the door phone does not ring but provides a two-way talk-path between the calling telephone and the called door phone. This enables telephone users to monitor sounds in the general area where the door phone is installed.

Door Lock Control

As an option, Port B of the DDCB can be connected to a door lock control device, instead of a door phone, to unlock a door. The door lock control device is not supplied by Toshiba and must be ordered separately. The door lock option is a hardware jumper located on the DDCB. This option provides relay contacts that will open, or close the Port B wire pair when a telephone's door lock button is pressed or when a door lock feature code is dialed from a telephone (see Figure 12-16 for option settings).

Door Phone/Lock Programming

Door phone assignments are in Program 507 and door lock assignments are in Program 508.

MDFB Wall Mounting

1. Remove the screw from the bottom of the cover. Detach the cover from the base and metal frame (see Figure 12-15).
2. Position the metal frame and base to the mounting surface and secure with two one-inch panhead wood screws.
3. Attach cover to the metal frame and base and secure with the screw which was removed in Step 1.

MDFB Volume Control Adjustments

1. Remove the screw from the bottom of the MDFB cover.
2. Detach the cover from the base and metal frame.
3. The volume level is changed by a screw adjustment on the back of the MDFB. Turn the screw with a flat-headed screwdriver while ringing the MDFB or while on a call with it. The volume level will change as the screw is turned.

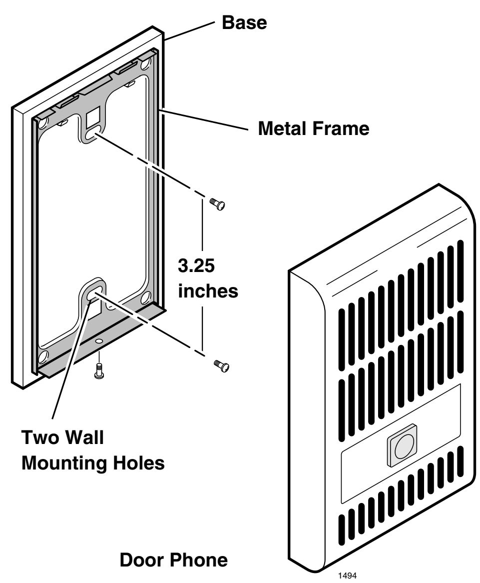


Figure 12-15 Door Phone (MDFB) Installation

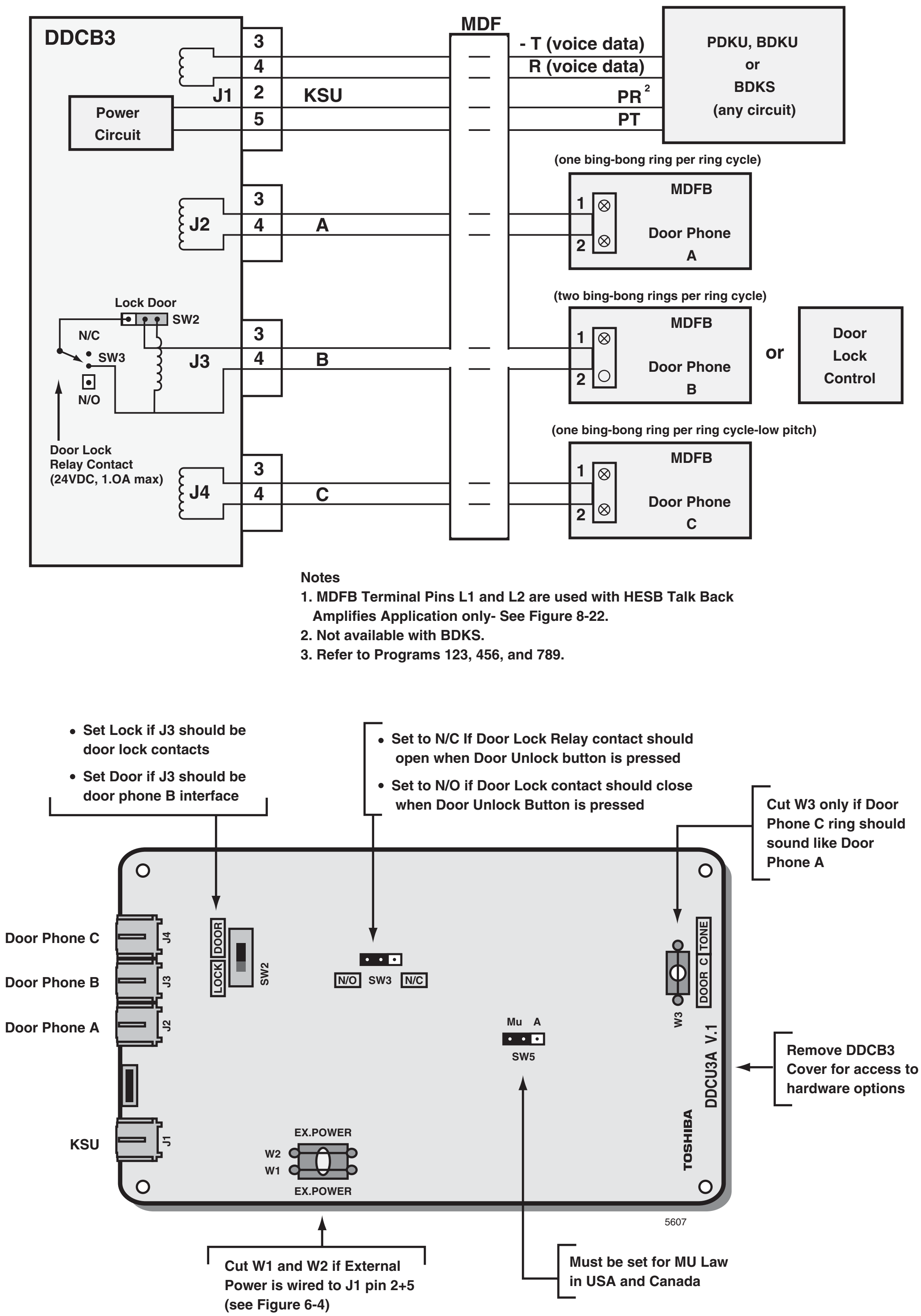


Figure 12-16 DDCB3 Wiring and DDCU Door Lock PCB

External Speaker Unit (HESB) Options

Strata CTX systems provide three options utilizing an HESB:

- Telephone External Ringer
- Amplified Page Speaker
- Talkback Amplified Page Speaker with talkback

System hardware requirements vary depending on the HESB option selected. See the following installation procedures for the hardware requirements for each option.

Telephone External Ringer

The loud ringing bell option enables the voice first or ringing signal tone to be amplified without the use of other manufacturers' equipment. The voice first and signal tone can be amplified on all electronic and digital telephones equipped with HHEU PCBs and HESB. (See Chapter 7 – Station Apparatus.)

The HESB automatically turns Off once the ringing call or voice first has been manually answered from the electronic or digital telephone. This turn-off feature prevents audio feedback problems.

Step 1: Set Up the Telephone for the External Ringer Option

3000 Telephone Instructions

➤ **To Turn the Loud Ringing Bell Feature On/Off (Default is Off)**

1. Press `369+Hold` (simultaneously).
2. Press `# FB08` (FB08 = Feature Button 08, not dial pad 8).
3. Press `Msg` (`Msg` LED turns On) to turn On the External Speaker (HESB) connection

   ...or press `Msg` again (`Msg` LED turns Off) to turn Off the External Speaker (HESB) connection.
4. Press `Hold`.

2000 Telephone Instructions

Important! *See Chapter 11 – Station Apparatus for instructions on the HHEU jumpers and cutting the EXSP on 2000-series digital telephones. See below for 3000 telephones.*

Step 2: Connect the HESB External Ringer to the 3000-series Telephone

1. Connect a jumper between terminals 2 and 10 on the HESB TB1 terminal block (Figure 12-21).
2. Connect a jumper between terminals 4 and 5 on the HESB TB2 terminal block.
3. Install a BHEU PCB and HESC-65A cable per Figures 12-17 and 12-18.

Note HESB connections made in Steps 4~6 can be accomplished using the HESB VOICE modular jack instead of the TB1 terminal block.

4. Connect terminal 1 of the HESB TB1 terminal block to the red (+) wire of the HESC-65A using a modular block.
5. Connect terminal 2 of the HESB TB1 terminal block to the green (-) wire of the HESC-65A using a modular block.

6. Connect terminal 8 of the HESB TB1 terminal block to the yellow (L2) wire of the HESC-65A cable using a modular block.
7. Connect the HACU-120 power supply's +12V lead to terminal 1 of the HESB TB2 terminal block, and connect the power supply's 0V lead to terminal 2.
8. Plug the provided power cord into the power supply and to a 115VAC ± 10VAC, 60Hz power source.

Important! *If AC voltage is not within range, have a qualified electrician correct the problem.*

Telephone (BHEU) to External Speaker (HESB) Cable Connection

The HESC-65A cable is required to connect the telephone BHEU to the HESB external speaker. The BHEU can be installed into the DKT3000-series telephones. It can also be installed into DKT3010 and DKT3020 telephones that have either a BVSU or BPCI installed. For DKT3001 telephones, the installation is same as below, only the connector location is different.

HESC-65A and BHEU Installation

1. Loosen the four captive screws on the telephone base, and remove the base. Use a screwdriver or other suitable tool to remove the plastic tab on the back of the base. (The HESC-65 cable connector is accessed through this opening. See Figure 12-17.)
2. Connect the HESC cable to P1 of the BHEU and feed it through the telephone base.
3. Position the BHEU PCB (component side down) on the standoffs inside the base, and secure with the two provided screws (see Figure 12-18).
4. Connect the BHEU integrated wire plug to P3 (HEU) on the telephone base PCB (see Figure 12-19). Note the location of the red wire

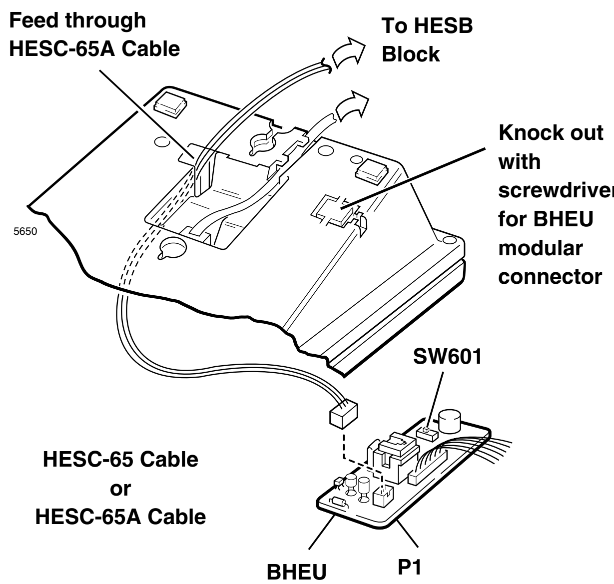


Figure 12-17 HESC-65A Cabling

...or for DKT3001 telephones only, connect the BHEU wire plug to P1 (HEU) on the telephone base PCB (see Figure 12-20). Note the location of the red wire.

5. Reinstall the base on the telephone.
6. Connect the HESC-65A cable to the HESB (see Figure 12-17).
7. Connect station wiring (see Figure 12-21).

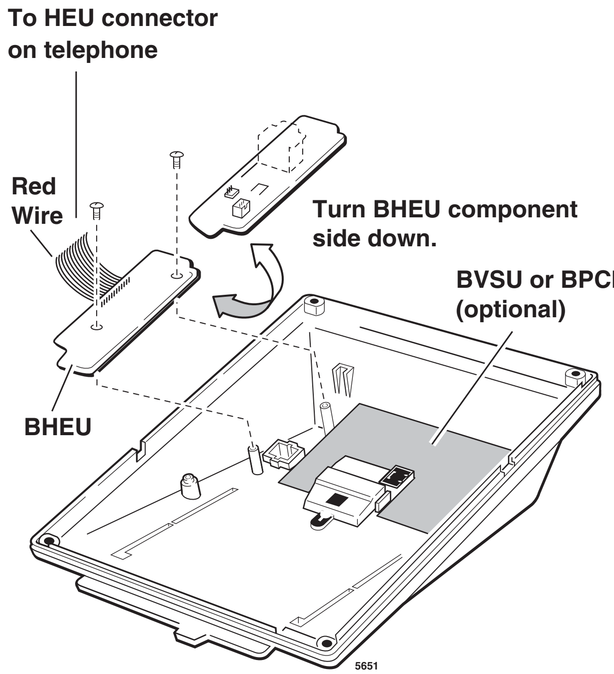


Figure 12-18 BHEU Installation

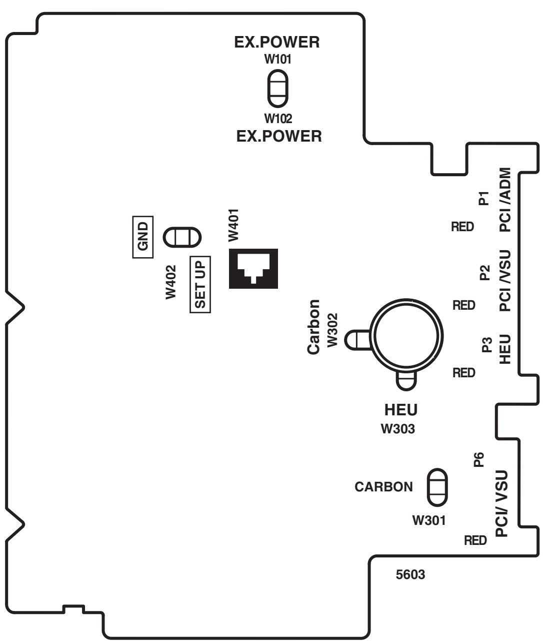


Figure 12-19 DKT3010, DKT3020, DKT3014 Strap and Connector Locations

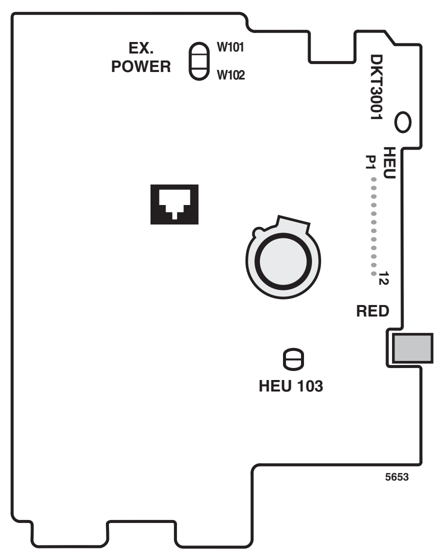


Figure 12-20 DKT3001 BHEU Connector Location

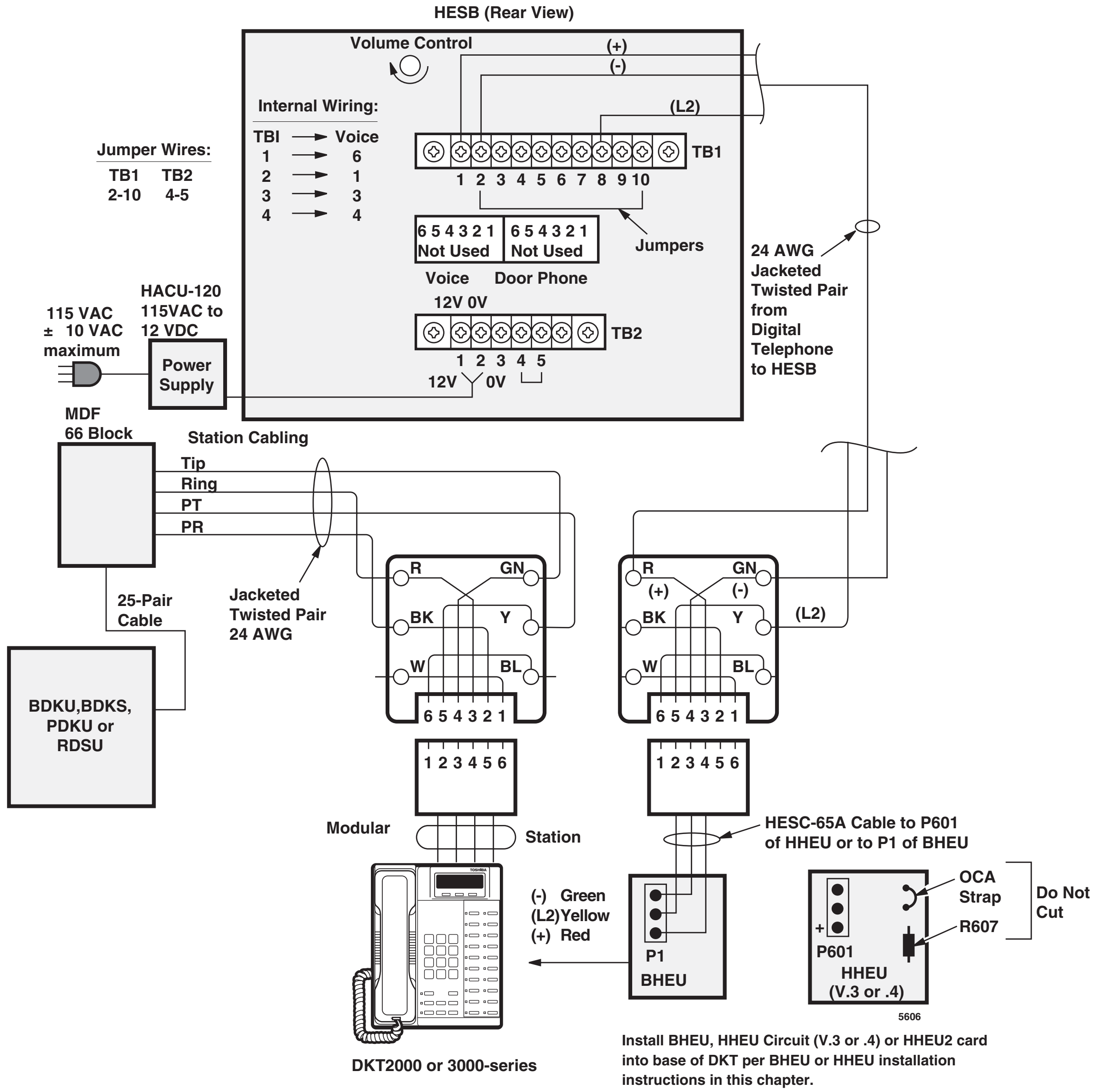


Figure 12-21 Wiring the Telephone External Ringer with HESB Interface

Step 3: Test the Telephone External Ringer Option

1. Test the AC input voltage by plugging power cord into the power supply and to a 115VAC±10VAC to 12VDC power source.
2. Make a CO or station call to the station configured for the loud ringing bell. Ringing will be heard over the HESB.
3. Use a small, slotted screwdriver to turn the volume control on the back of the HESB to the desired level and adjust the ring volume control on the telephone.
4. If ringing is heard at the station, but not over the HESB, check the following while the station is ringing:
   - Using a suitable voltmeter, measure voltage across terminals 1 (+) and 2 (-) of the HESB TB1 terminal block. Voltage indication should be 4.5~5VDC.

Note Ringing stops once the call is manually answered. There should be NO voltage potential across terminals 1 and 2.

   - If voltage is not as specified during ringing, check that the telephone wiring connections to the HESB have been made properly (wires to terminals 1 and 2 of the HESB TB1 terminal block may have been reversed).

Amplified Page Speaker Option

The amplified speaker option enables the HESB to be configured as a paging speaker. The HESB is connected to the BIOU 600-ohm page output to provide an amplified external speaker.

➤ **To install the HESB amplified speaker option**

1. Connect a jumper between terminals 1 and 2 of the HESB TB1 terminal block (see Figure 12-22).
2. Connect a jumper between terminals 6 and 7 of the HESB TB1 terminal block.
3. Connect a jumper between terminals 5 and 8 of the HESB TB1 terminal block.
4. Connect a jumper between terminals 3 and 4 of the HESB TB2 terminal block.
5. Connect a jumper between terminals 5 and 6 of the HESB TB2 terminal block.
6. Connect the BIOU or ACTU 600-ohm page output (pins 13 and 38) to terminals 3 and 4 of the HESB TB1 terminal block.
7. Connect the power supply's +12V lead to terminal 1 of the HESB TB2 terminal block, and connect the 0V lead to terminal 2.
8. Plug the provided power cord into the power supply and to a 115VAC±10VAC to 12VDC power source.
9. Set the BIOU SW600 switch to the SPO position.

Important! *If AC voltage is not within range, have a qualified electrician correct the problem.*

➤ To test the amplified speaker option

1. Make an external page. The page should be heard over the HESB.
2. Verify that someone speaking into the door phone can be heard at the paging station. (With this application, pressing the door phone button is not required to talk back through the door phone.)

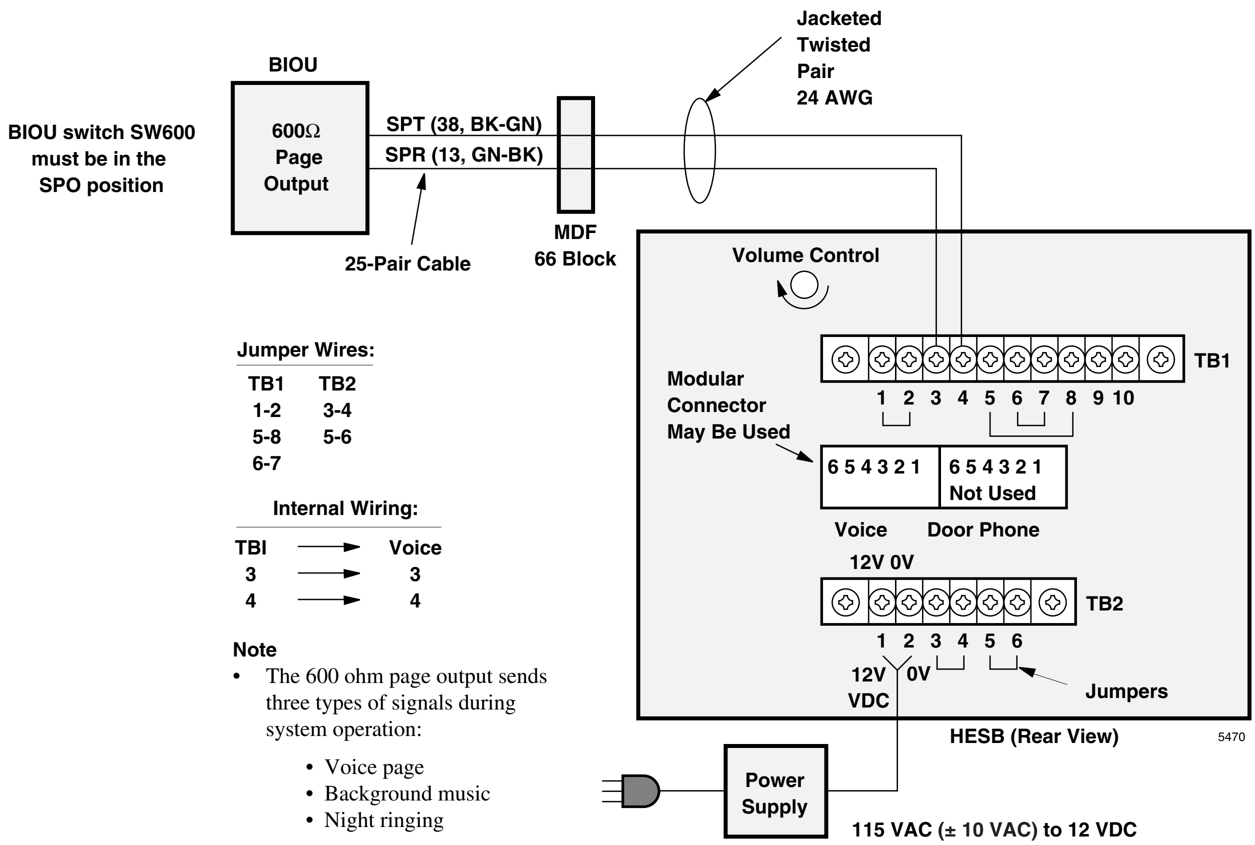


Figure 12-22 Amplified Page Speaker with HESB Interface

Talkback Amplified Page Speaker with Talkback Option

The talkback amplified speaker option enables a talkback speaker to be provided in areas where a telephone is not needed. In this configuration, the HESB is connected to the BIOU 600 ohm (duplex) output and is used as the amplifier and speaker.

A door phone unit (MDFB) is connected to the HESB, and serves as a microphone to provide talkback operation. (The MDFB push-button is inoperative, and the unit serves only as a microphone for talkback and not as the normal door phone.)

Note The BIOU 600 ohm is a two-way (duplex) page output compatible with most commercially available talkback amplifiers – door phone not required for talkback.

➤ **To install the HESB amplified page speaker with talkback**

1. Connect a jumper between terminals 1 and 2 of the HESB TB1 terminal block (see Figure 12-23).
2. Connect a jumper between terminals 3 and 4 of the HESB TB2 terminal block.
3. Connect a jumper between terminals 5 and 6 of the HESB TB2 terminal block.

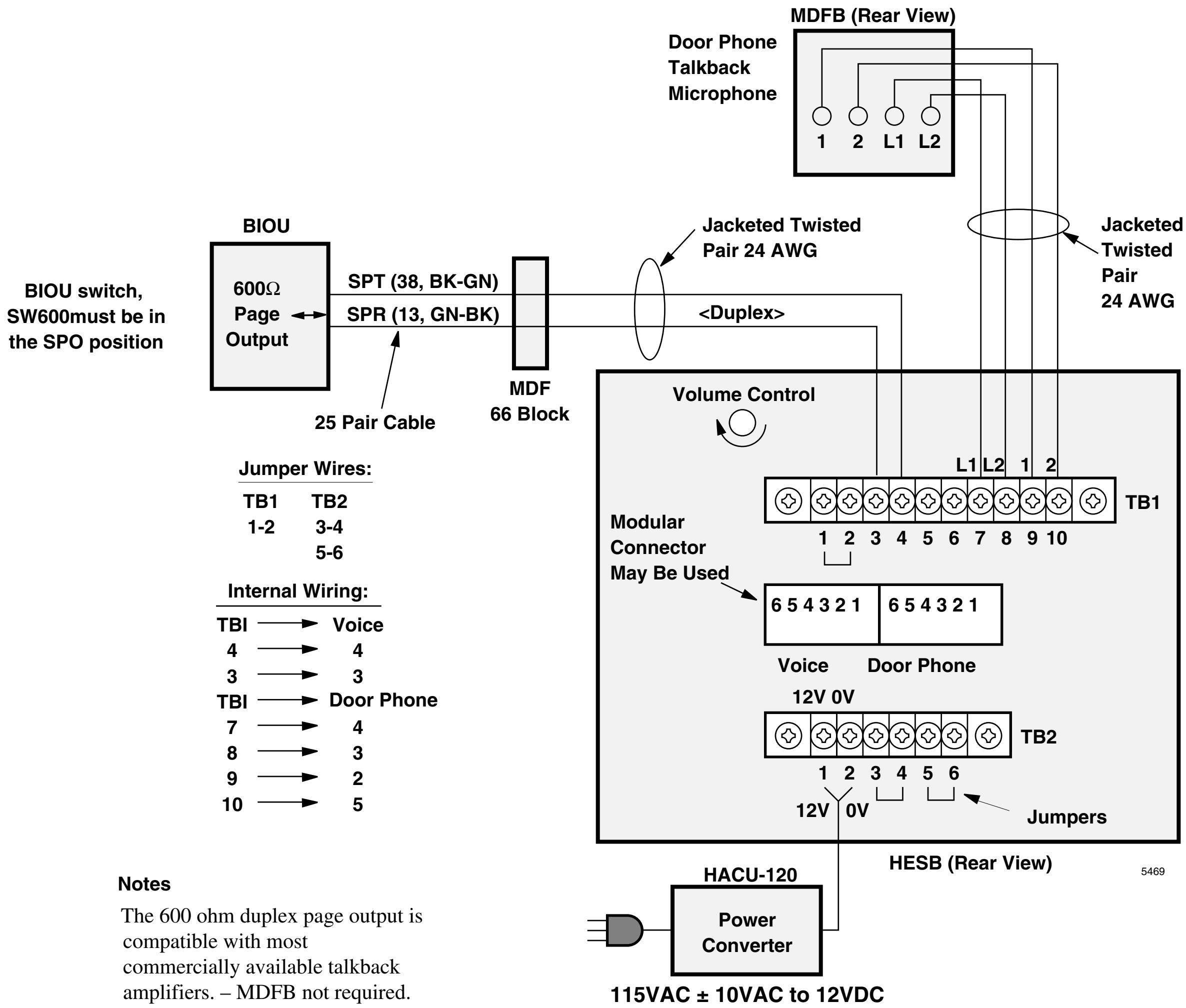
Note HESB connections made in Steps 4~7 may be accomplished using the HESB VOICE and door phone modular jack instead of the TB1 terminal block.

4. Connect terminal 7 of the HESB TB1 terminal block to Pin L1 of the MDFB.
5. Connect terminal 8 of the HESB TB1 terminal block to Pin L2 of the MDFB
6. Connect terminal 9 of the HESB TB1 terminal block to Pin 1 of the MDFB.
7. Connect terminal 10 of the HESB TB1 terminal block to Pin 2 of the MDFB.
8. Connect the BIOU 600-ohm page output (pins 13 and 38) to terminals 3 and 4 of the HESB TB1 terminal block.
9. Set the BIOU SW600 switch to the SPO position.
10. Connect the HACU-120’s +12V lead to terminal 1 of the HESB TB2 terminal block, and connect the 0V lead to terminal 2.
11. Plug the provided power cord into the power supply and to a 115VAC±10VAC to 12VDC.

Important! *If AC voltage is not within range, have a qualified electrician correct the problem.*

➤ **To test the talkback amplified speaker**

1. Make an external page. Page will be heard over the HESB.
2. Verify that someone speaking into the door phone can be heard at the paging station. (With this application, pressing the door phone button is not required to talk back through the door phone.)



Notes

The 600 ohm duplex page output is compatible with most commercially available talkback amplifiers. – MDFB not required.

Figure 12-23 Amplified Page/Talk-Back with HESB Interface

HESB Wall Mounting

Some applications may require that the HESB is mounted on a wall or other vertical surface.

➤ **To wall mount the HESB**

1. Find a suitable location on the mounting surface for the HESB (see Figure 12-24).
2. Screw a 1.25-inch panhead wood screw into the mounting surface.
3. Hang the HESB from the screw.

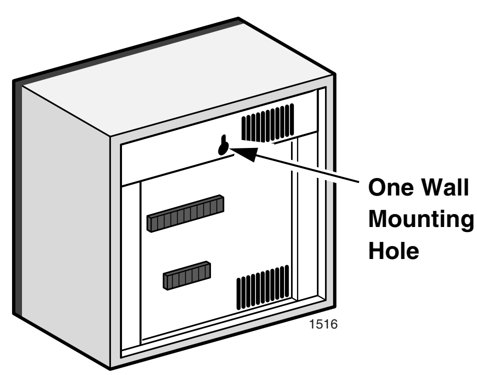


Figure 12-24 HESB Wall Mounting

Power Failure Options

In the event of a power failure, Strata CTX uses these options:

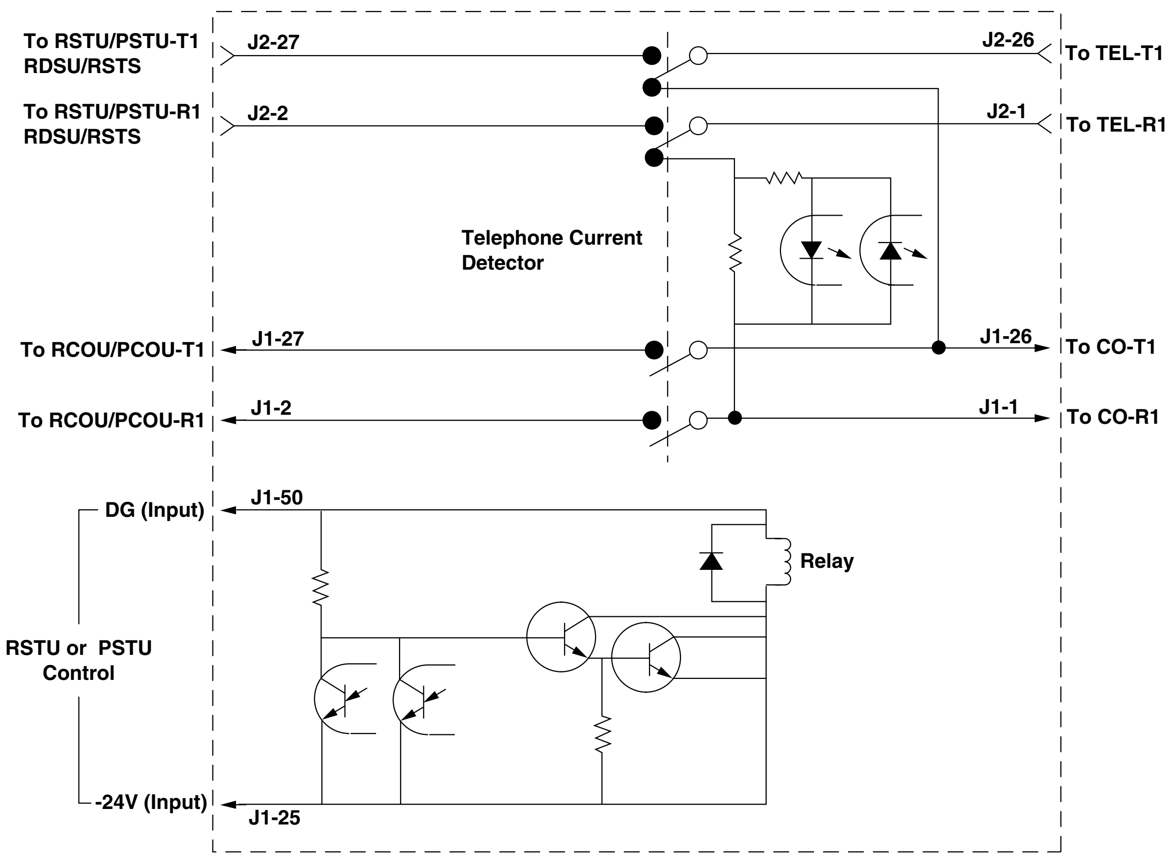
Reserve Power

For information on the Reserve Power Option, see Chapter 1 – Installation.

Power Failure Transfer Unit

An optional Power Failure Transfer Unit (DPFT) can be installed that automatically connects up to eight selected CO lines directly to designated standard telephones in the event of a power failure. The DPFT enables normal operation of the selected CO lines and standard telephones when the system is in service. When power is restored, each telephone is independently reconnected to system standard telephone circuit ports after it is finished with its direct CO line call. The DPFT is normally installed on the MDF.

Figure 12-25 provides a circuit diagram of the DPFT.



Notes
- Representation of first of eight circuits.
- Conditions shown with AC power (-24VDC) off.

Figure 12-25 DPFT Circuit Diagram

Power Failure Emergency Transfer (DPFT) Installation

1. Mount the DPFT on or near the MDF.

   Note See Chapter 10 – MDF PCB Wiring, DPFT/MDF interconnecting tables.

2. Using 25-pair cables with amphenol-type connectors (female for DPFT connector J1, male for DPFT connector J2), connect the DPFT to two 66-type quick-connect blocks.
3. Connect the CO lines selected for emergency use to the DPFT J1-block “CO-TIP” and “CO-RING” terminals.
4. Connect the RCOU, RCOS (or PCOU) circuits related to the emergency CO lines to the DPFT J1-block “RCOU-TIP” and “RCOU-RING” terminals.
5. Connect the standard telephone stations selected for emergency use to the DPFT J2-block “TEL-TIP” and “TEL-RING” terminals.
6. Connect the RSTU, RDSU/RSTS or PSTU standard telephone circuits related to the emergency standard telephones to DPFT J2-block “PSTU/ RSTU-TIP” and “PSTU/RSTU-RING” terminals.
7. Connect the DPFT to the RDSU/RSTU/PSTU DG and -24V terminals (See Chapter 10 – MDF PCB Wiring for RSTU/PSTU and RCOU/PCOU wiring/interconnecting details). The -24V (Pin 25) and DG (Pin 50) ground terminals are available on the RSTU2, RDSU, or PSTU only.

➤ **To test the operation of the DPFT**

1. Turn the system power switch Off.
2. Verify that CO dial tone is available at each standard telephone connected to the DPFT.
3. Call back to each telephone using an outside line.

Station Message Detail Recording (SMDR)

For each incoming, outgoing, tandem or conference call, the Strata CTX can generate a record that includes details of the call, including the originating station or trunk, the start time of the call, its duration, authorization codes, etc. If a station user dials “911,” the Strata CTX also generates a record at the beginning of the call as part of its internal notification that an emergency call is in progress.

The BSIS optional PCB attaches to the ACTU of the CTX100 or the BECU of the CTX670 to provide four RS-232 interface jacks (one for SMDR and one for SMDI). See Figures 12-6 and 12-7, starting on page 12-6 for connection information.

SMDR Record Types

Distinct records are generated for different types of calls. The table below lists the record types. The type of each record is identified by a letter entry in the column of the record.

Table 12-1 Call Record Types

Record Type	Notes
B (aBandoned)	When a call is abandoned
N (Normal)	Simple outgoing or incoming call
S (Start)	Start of complex outgoing or incoming call or 911 call
X (transfer)	When a call is transferred
E (End)	This record is associated with a specific S or X records, and indicates termination of a call
I (Initial)	When system is initialized
T (Time)	When the system time or date is changed
A (Authorization)	When the input Account Code is verified and the result is successful, the Account Code is defined as the Authorization Code.
C (Charge Account)	When an Account Code is entered
M (Charge Conference)	When an Account Code is entered during a conference call

The use of multiple records allows the CTX to account for multi-stage calls such as transfers and conferences. A simple outgoing or incoming call would generate a Normal record. A transferred call would generate a Start record for the first segment of the call and an End record for the second segment of the call. The appropriate times would be stored in each. A detailed description of SMDR is provided in a separate manual.

Several fields in the record may displayed or masked based on system programming. They include DISA security codes, authorization codes, ANI, DNIS and Caller ID.

The Strata CTX can buffer up to 1000 SMDR records in response to a loss of DTR signal from an attached call accounting device or external buffer. When the buffer overflows, subsequent call records will be lost until the buffer is cleared. The CTX buffer will be cleared by a system restart or loss of system power.

Table 12-2 SMDR Record Format

Line	Column	Name	Format	Notes
1	1(1)	Record Type	"N"/"S"/"X"/"E"/"B"/ "I"/"T"/"A"/"C"/"M"	See "SMDR Record Types" on page 12-27.
	2(1)	Space		
	3-5(3)	Record Number	XXX	Record Number (000 -- 127)
	6(1)	Space		
	7-12(6)	Node number	XX	00 - 99
	13(1)	Space		
	14-20(7)	Orig Information	"DN"+XXXXX "CF"+ XXXXX "T"+OLG+MMM "T"+ILG+MMM "A"+OLG+MMM "A"+ILG+MMM	Prime DN X=ID of conference "T"/"A":Answersupervised/Unsupervised ILG: Incoming Line Group OLG: Outgoing Line Group MMM: CO number/Channel Group Number (Left positioned and padded space)
	21(1)	Space		
	22-28(7)	Term Information		
	29(1)	Space		
	30-43(14)	Time stamp	MO/DD HH:MM:SS	N/E Record: End of Call S Record:Start of Call If 911, time trunk is seized. X Record: Completion of transfer B Record: The call is abandoned I Record: System initialized T Record: Original/New system time A/C/M Record: Input account code MO = Month(01 -- 12) DD = Day (00 -- 31) HH = Hour (00 -- 23) MM = Minutes 00 -- 59) SS = Seconds (00 -- 59)
	44(1)	Space		
	45-54(10)	Call duration	HH:MM:SS.S	HH = Hour (00 -- 23) MM = Minutes (00 -- 59) SS = Seconds (00 -- 59) S = always 0
	55(1)	Space		
	56-87(32)	Dial information	XX….X	Dials/Account Codes (Left positioned and padded space)

Table 12-2 SMDR Record Format *(continued)*

Line	Column	Name	Format	Notes
2	1(1)	Spaces		
	2(1)	New line	"&"	
	3-19(17)	Caller ID CESID	XXX…XXX "C"+ XXX…X	Caller ID CESID (Left positioned and padded spaces)
	20(1)	Spaces		
	21-24(4)	DISA	"DISA"	
	25(1)	Spaces		
	26-38(13)	ANI	XXXXX...XXXX	(00 -- 99) Area Code (000 -- 999) Exchange Code (000 -- 999) Extended Exchange code (0000 -- 9999)
	39(1)	Spaces		
	40-46(7)	DNIS	XXXXXXX	(0000000 -- 9999999)
	47(1)	Spaces		
	48-54(7)	AUXID 1	"DN"+XXXXX	XXXXX = Prime DN (Responsibility for outgoing)
	55(1)	Spaces		
	56-62(7)	AUXID 2	NN+XXXXX	NN = Node number (00 – 99) XXXXX = Prime DN

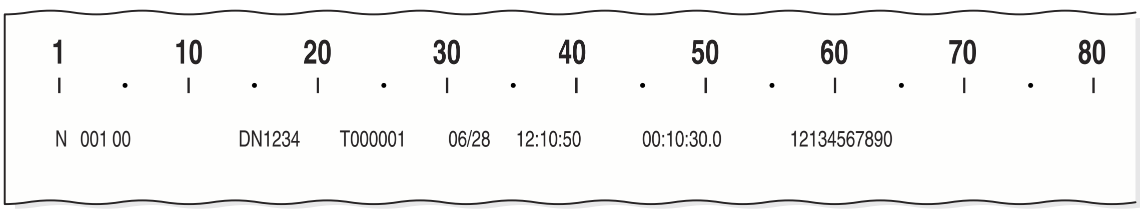


Figure 12-26 Sample Call Record – Simple Outing Call, Outside Party Answers (Rel. 1.02 or lower)

Table 12-3 Sample Call Record Explanation (Rel. 1.02 or lower)

Field	Notes
N	Normal incoming or outgoing call record.
001	Record number 1.
00	Used to identify the Node ID in a Strata Net network. Not used in a standalone system.
DN1234	Directory Number (DN) 1234 originated the call.
T000001	The call went out on Trunk Number 1.
06/28	Date
12:10:50	Time at which call was answered.
00:10:30:0	Duration of the call to the tenth of a second.
12134567890	The destination number dialed.
&	Start of a new line. More complex call records may use two lines.

Record Formats (Release 1.03)

Table 12-4 SMDR Record Format (Software Release 1.03)

Line	Column	Name	Format	Notes
1	1(1)	Record Type	"N"/"S"/"X"/"E"/"B"/ "I"/"T"/"A"/"C"/"M"	See "SMDR Record Types" on page 12-27.
	2(1)	Space		
	3-5(3)	Record Number	XXX	Record Number (000 -- 127)
	6(1)	Space		
	7-12(6)	Node number	XX	00 - 99
	13(1)	Space		
	14-22(9)	Orig Information	"DN"+XXXXX "CF"+ XXXXX "T"+OLG+MMM+NN "T"+ILG+MMM+NN "A"+OLG+MMM+NN "A"+ILG+MMM+NN	Prime DN X=ID of conference "T"/"A":Answersupervised/Unsupervised ILG: Incoming Line Group OLG: Outgoing Line Group MMM: CO number/Channel Group No. NN: ISDN-Bch if caller seizes non-ISDN trunk, then "00" is shown as NN value. (Left positioned and padded space)
	23(1)	Space		
	24-32(9)	Term Information		
	33(1)	Space		
	34-47(14)	Time stamp	MO/DD HH:MM:SS	N/E Record: End of Call S Record:Start of Call If 911, time trunk is seized. X Record: Completion of transfer B Record: The call is abandoned I Record: System initialized T Record: Original/New system time A/C/M Record: Input account code MO = Month(01 -- 12) DD = Day (00 -- 31) HH = Hour (00 -- 23) MM = Minutes 00 -- 59) SS = Seconds (00 -- 59)
	48(1)	Space		
	49-58(10)	Call duration	HH:MM:SS.S	HH = Hour (00 -- 23) MM = Minutes (00 -- 59) SS = Seconds (00 -- 59) S = always 0
	59(1)	Space		
	60-91(32)	Dial information	XX….X	Dials/Account Codes (Left positioned and padded space)

Table 12-4 SMDR Record Format (Software Release 1.03) *(continued)*

Line	Column	Name	Format	Notes
2	1(1)	Spaces		
	2(1)	New line	"&"	
	3-19(17)	Caller ID CESID	XXX…XXX "C"+ XXX…X	Caller ID CESID (Left positioned and padded spaces)
	20(1)	Spaces		
	21-24(4)	DISA	"DISA"	
	25(1)	Spaces		
	26-38(13)	ANI	XXXXX...XXXX	(00 -- 99) Area Code (000 -- 999) Exchange Code (000 -- 999) Extended Exchange code (0000 -- 9999)
	39(1)	Spaces		
	40-46(7)	DNIS	XXXXXXX	(0000000 -- 9999999)
	47(1)	Spaces		
	48-54(7)	AUXID 1	"DN"+XXXXX	XXXXX = Prime DN (Responsibility for outgoing)
	55(1)	Spaces		
	56-62(7)	AUXID 2	NN+XXXXX	NN = Node number (00 – 99) XXXXX = Prime DN

Figure 12-27 Sample Call Record – Simple Outing Call, Outside Party Answers (Software Release R1.03)

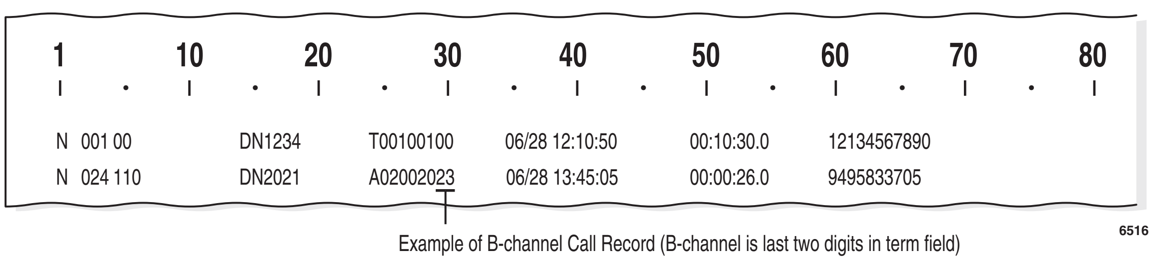


Table 12-5 Sample Call Record Explanation (Software Release R1.03)

Field	Notes
N	Normal incoming or outgoing call record.
001	Record number 1.
00	Used to identify the Node ID in a Strata Net network. Not used in a standalone system.
DN1234	Directory Number (DN) 1234 originated the call.
T00100100	The call went out on Trunk Number 1, OLG 1.
06/28	Date
12:10:50	Time at which call was answered.
00:10:30:0	Duration of the call to the tenth of a second.
12134567890	The destination number dialed.
&	Start of a new line. More complex call records may use two lines.

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